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ABSTRACT

If teachers are to help students develop higher-order reading, thinking, and writing skills, then researchers must begin by articulating the ways of knowing that are central to particular domains. A study was elaborated to provide initial information about the ways in which people talk about "knowing" in academic subjects as they appear in the scholarly literature, in the pedagogical literature, and in teachers' understandings of what counts as knowing in their classrooms. The first part of the study is an extensive literature review. In the second part of the study, subjects, 48 biology, American history, and American literature high school and college teachers, completed background questionnaires and two hour-long interviews. The interviews focused on the teachers' general conceptions of teaching and learning and the goals of instruction in a unit of study from a current course in their discipline. Results indicated that the teachers favored a relatively traditional approach to instruction, with lectures and teacher-led discussion playing the dominant role, and with student centered activities appearing less frequently. These results parallel other research in suggesting that classroom emphasis tends to be on specific content at the expense of the rules of argument and evidence unique to each discipline. (Twenty-one tables of data are included, and 256 references and an appendix of interview schedules and questionnaires are attached. (MS)

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SPEAKING OF KNOWING:

CONCEPTIONS OF LEARNING IN ACADEMIC SUBJECTS

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July 1988

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FINAL REPORT

U.S. Department of Education, Office of Educational Research and Improvement, Grant No. G008610967

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Speaking of Knowing:

Conceptions of Learning in Academic Subjects

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July 1988

Final Report, Academic Learning in High School Subjects, U.S. Department of Education, Office of Educational Research and Improvement, Grant No. G008610967

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Introduction

Chapter 1

This study was intended to provide initial information about the ways in which people talk about "knowing" in academic subjects as they appear in the scholarly literature, in the pedagogical literature, and in teachers' understandings of what counts as knowing in their classrooms. We also wanted to see if the focus on content (to the neglect of the structure of thinking) that has appeared in earlier studies (Applebee et al., 1984; Langer & Applebee, 1987) has a root in the disciplinary pasts, or if there is a dichotomy between the ways the fields regard knowledge and the ways in which schools regard knowledge. This information, we hoped, would help us to further understand the role of writing in the learning of various disciplines.

The hypothesis we investigated is a fundamental one: that a variety of current concerns in American education stem from an underconceptualization of what it means to "know" a subject -- and of how students are asked to display what they know. In response to current concerns about poor academic performance, attempts at educational reform have placed a renewed focus on higher order thinking and reasoning, on academic achievement, and on testing. Closely associated with these movements has been a resurgence of concern with the teaching of writing and the uses of writing across the curriculum, in part because extended writing about a topic is often seen as one way to encourage deeper and more careful thinking.

However, our earlier work led us to believe that the broad philosophical strokes that frame the principles and values of such reform provide little guidance for schools. And as a result, conceptualizations of relationships between writing and learning continue to go astray at a variety of critical points.

The argument underlying our hypothesis runs as follows:

1) That a well-conceived education has two parts, a concern with particular content (e.g., the Great Books) and a concern with the development of the intellect; and that writing has a place in the formulation as well as display of both kinds of knowledge.

2) That it has been easier to assess (and criticize) education in terms of the particular content covered than it has in terms of the ways of thinking that are engendered, and thus, writing has tended to be used as a way to evaluate content knowledge, rather than as a way to teach and learn the ways of thinking (as well as the content) within a discipline.

3) That proponents of educational reform, and of the central

place of academic learning in schooling, have in turn centered their reforms around particular content-- in large part because it can be relatively easily specified. This has led to a trivialization of our understanding of academic learning, of the contribution of writing to academic learning, and of expectations for student achievement.

4) That we are at an intellectually and politically opportune time to reconceptualize the nature of academic learning, and with it the nature of liberal education, in terms of the alternative ways of knowing implicit in the various academic disciplines.

5) Finally, that if we do so, concerns with such issues as the teaching of writing, higher order thinking, and writing across the curriculum will appear as differing manifestations of the same underlying underconceptualization. In examining various views of subject matter knowledge and learning, we will begin to address issues that are at the roots of the teaching of discipline-specific writing.

Because we were interested in these issues from the perspective of academic coursework, we searched for evidence of the two components of academic learning in each discipline, one having to do with particular content knowledge, the other having to do with ways of knowing and thinking that are accepted as appropriate and necessary for understanding the particular field. That the content differs from discipline to discipline is obvious and trivial; that the ways of knowing and thinking also differ was less clear. There is a long tradition in American education of granting equivalent "mental discipline" to all academic subjects, as well as of teaching generic modes of argument and exposition as part of the English curriculum. At the same time, the philosophy of each school subject has usually stressed its unique value to culture and society-- the value of "historical perspective," "scientific objectivity," or "literary sensitivity," for example.

We traced these conflicting views in the history and philosophy of each discipline, testing our argument that the lack of a clear conception of what is unique and what is generic has led to an overemphasis on particular content (where the uniqueness of each discipline is clear and easily assessed), and a devaluing of ways of thinking and knowing (which we have failed to articulate clearly or to implement well in any subject).

To untangle these issues, this study also examined what is currently involved in the teaching of selected academic disciplines. Here we studied the conceptions of academic learning held by a spectrum of university and high school teachers in each of the subject areas. We focused on their general view of what counts as important in their subject, as well as on the ways in which they were able to articulate the features of that knowledge. We examined their expressions of

the content and knowledge they value, as well as the values revealed in their discussions of student writing in their classes. Their conceptions of academic learning were in turn related to the evaluation criteria that they used to judge student performance.

Based on our previous work, we conjectured that most teachers have been trained (and are better able) to articulate the specific content rather than the ways of knowing and thinking reflected in their subject matter, and that this in turn leads to a prevailing and unintended emphasis on lower level skills-- on recitation rather than reformulation of what is learned. On the other hand, we suspected that when teachers have a clear conception of ways of thinking and knowing within their discipline, their responses to student writing would support a type of academic learning more in keeping with the ways of thinking particular to that discipline.

To provide a manageable universe of study, we focused our attention on three high school subjects: American literature, American history, and biology. Each of these reflects a major component of liberal education in the United States; each is taught at high school as well as college levels; and all three are usually taught in grades 10 or 11. This allowed us to contrast high school with college conceptions of academic learning, as well as to examine the extent to which the three disciplines are based upon different rules of evidence and argument-- that is, the extent to which they reflect discipline-specific ways of thinking and knowing.

Related Studies

In the past few years, a number of studies have reported that American students are not learning to think deeply enough, across a wide range of academic subjects (Applebee, Langer, and Mullis 1985; 1986a,b; 1987a,b; 1988; in preparation; Barrow, Mullis, & Phillips, 1972; Boyer, 1983; Brown, 1981, 1982; Carpenter, Corbitt, Kepner, Lindquist & Rets, 1981; Dossey, Mullis, Lindquist, & Chambers 1988; Mullis & Jenkins, in press; NAEP, 1978; National Commission on Excellence in Education, 1983).

In a 1981 report, for example, the National Assessment of Educational Progress examined students' comprehension on a series of content-based reading tasks that required them to 1) show an initial understanding of a variety of reading passages, 2) make preliminary interpretations of those passages, 3) reexamine the text in light of these interpretations, and 4) use the results of this reexamination to develop a fuller and more accurate interpretation. With few exceptions, students performed well in the quick and easy judgments involved in the first two steps-- they could understand the literal meaning of the passages and make initial interpretations. But few students were able to undertake the disciplined thinking required in the last two

steps. As the report concluded, "A society in which the habits of disciplined reading, analysis, interpretation, and discussion are not sufficiently cultivated has much to fear."

More recent results from the National Assessment (Applebee, Langer, & Mullis, 1985, 1986, 1987, 1988) show that for reading and writing the proportion of students able to engage in such reasoned and disciplined thinking has remained unchanged in the last fifteen years. The proportion of 17-year-olds at this level has remained remarkably low-- ranging between 4 and 5 percent. As authors of the NAEP reports in 1981, 1985, and 1986, we find these results troubling.

The National Assessment findings are based in large part on tasks that required students to write about what they were learning, developing arguments and lines of evidence to support any opinions they might voice. Such arguments reveal a good deal about the nature of students' understanding of the subjects they have been studying-- in particular whether their knowledge is limited to particular content, or whether they are also able to recast and reformulate that content appropriately, drawing on the ways of thinking and knowing characteristic of the discipline under study. In turn, we believe the writing students are asked to do is in fact a good reflection of the teachers' underlying views of what is important in their subject areas.

We have explored this relationship between academic writing and thinking in a series of studies (Applebee, 1981; Applebee, Langer, et al., 1984; Langer, 1984; Langer & Applebee, 1986; 1987); the studies have examined students' writing across a variety of academic disciplines, and traced the relationships between that writing, the teachers' values, and the types of learning fostered in their classrooms. The studies combined intensive study of individual schools with larger-scale survey methodologies, and found that students were rarely challenged to explain their interpretations, or encouraged to examine the evidence on which they had based their conclusions. More typically, in all areas of the curriculum, they were asked to summarize information and points of view that had been presented to them by the teacher or the textbook.

In our initial studies, we attributed such findings to a lack of effective models of alternative approaches to instruction-- in particular, we noted the lack of instructional models that stressed writing as a process of thinking about new ideas and experiences (even though the literature on writing instruction placed great value on such approaches). In response to the need for such models, we initiated a series of studies of teachers who used writing in interesting and effective ways, in a variety of academic disciplines. Though we planned these studies as a way to develop a series of models of effective instruction, the major outcome was to highlight serious problems in current conceptualizations of academic learning (Langer & Applebee, 1987).

In these studies, we found that if new activities stress one kind of knowledge but teachers have been trained to look for other types of performance as evidence of learning, the new approaches make little difference. Results were consistent across a variety of subject areas (including science, history, and English). Teachers focus upon relatively basic knowledge about a subject, and are relatively successful in insuring that students develop an understanding of their subject at that basic level. At the same time, they fail to develop advanced skills, whether in science, history, or English.

Our most recent studies have led us to consider some of the underlying causes of this situation, causes that seem to be common across a variety of high school subjects. Some of these causes are institutional, and tied to evaluation systems, public expectations, and conditions of instruction. Others are more directly related to our present concerns with the content of instruction-- with what students are asked to learn and with what teachers have learned to look for as evidence of that learning. One central problem is that while teachers can easily recognize (and reward) "correct" information, they have more trouble articulating the rhetoric or rules-of-evidence that govern ways of thinking and knowing within their particular disciplines. As a result, their definitions of progress, and of success, are inevitably based on those aspects of learning that they can articulate-- the facts or information out of which arguments may be constructed, rather than the reasoning skills that students need to construct such arguments for themselves.

One central concern underlying the present study was that if teachers are to help students develop higher-order reading, thinking, and writing skills, then researchers such as ourselves must begin by articulating the ways of knowing that are central to particular domains. Only then can we begin to help teachers develop new ways to conceptualize student learning in terms of the ways in which students think about and discuss the subjects they are learning, rather than in terms of recitation of rote content.

The validity of this assumption depends in part upon the level of analysis that one adopts. Previous studies have made it clear that there are broad strategies of argument or uses of language that are common to the various high school subjects (Applebee, 1981; Applebee, Langer, et al., 1984; Britton et al., 1975; Calfee, 1987; Calfee & Curley, 1984; Langer & Applebee, 1987). Students of literature, of history, and of science write reports about specific events, for example, and also write analyses based on their observations. These strategies capture consistencies across varied contexts of languge use. At the same time, however, the similarity in underlying purpose may be masking very important differences in the ways in which these purposes are achieved. These differences are likely to involve very fundamental concepts-- notions of causality and proof, of evidence or warrants for claims, of assumptions that can be taken for granted, and of

premises that must be made explicit and defended. Such concepts may lie at the heart of successful performance in a new discipline, as well as at the heart of the development of the higher-level intellectual skills that so few students seem to achieve.

Our studies of effective teachers of English, science, and history have highlighted the extent to which schools and textbooks treat academic learning as a function of particular content (often codified in elaborate scope-and-sequence charts) rather than in terms of ways of knowing. It is this content that drives curriculum and that is reflected in the class, school, and district examinations the students face.

There is another way to view the classroom, however, that transforms the nature of academic learning. This is to view the classroom as a community of scholars (or of scholars and apprentices) with its own public forums with associated rules of evidence and procedures for carrying the discussion forward. Students must learn, then, not only the "basic facts" around which discussion is structured, but the legal and illegal ways in which those facts can be mustered in the forum defined by that classroom. Such a forum is partly oral, in the presentations and discussions that make up the dialogue of instruction, and partly written, in the materials that students read and the papers they write. The quality of the reading materials is important, since these provide the most extensive models of what counts as effective discourse; the nature of student writing tasks is also important, since the opportunity for individuals to make extended contributions during class discussion are necessarily limited. Writing (and the thinking that accompanies it) then becomes a primary and necessary vehicle for practicing the ways of organizing and presenting ideas that are most appropriate to a particular subject area. In such a view, writing becomes a major vehicle of instruction in all of the academic disciplines.

This is an unusual view of academic learning, and indeed of instruction. What evidence can we muster for it? A variety of scholars have put forth related arguments, developing them in the context of an examination of the conceptual, intellectual, or social traditions of a given disciplinary community (Bazerman, 1981, 1982; Bizzell, 1982; Kuhn, 1962; Odell, 1980; Roland, 1982). Herrington (1985) complements this theoretical work by studying the nature of such disciplinary communities or <u>forums</u> at the college level. Basing her conclusions on lengthy enthnographies of two chemical engineering classes, she found that even within the specialized context represented by this subject-matter, the demands of the "forums" in the two classes were very different. Students were learning not only the principles of chemical engineering, but the specific types of claims and warrants that were construed as effective discourse in particular contexts. These claims and warrants varied between the two classes (even though they were taught by the same professors), and were particularly apparent in students' writing and the professors' reactions to that writing. Success in these

classes, then, depended in part upon learning highly specific strategies and routines that were inextricably linked with the particular content under study. Other recent studies have also examined discourse features of discipline specific writing and the social environments in which these features are communicated and learned (Berkenkotter, Huckin, & Ackerman, 1988; McCarthy, 1987; North, 1986).

In a very different tradition, Applebee, Durst, and Newell (1984) analyzed arguments produced by student and published writers in science and social studies. Using a variety of text-analytic procedures, this study found not only that the text produced by students and published writers differed in consistent ways, but also that the patterns of differences were different in the two subject areas. These differences between subject areas were particularly clear in the pattern of linguistic features marking causality, time sequence, logical sequence, and the like -- the features most likely to reflect differing types of evidence, as well as different ways of organizing that evidence to sustain an extended discourse.

Yet characteristics such as those described by Herrington (1985) or by Applebee, Durst, and Newell (1984) are rarely articulated by the teachers involved, though there may be an intuitive recognition that such differences exist. If we are to avoid a trivialization of academic learning, we must learn to articulate the features of argument and analysis that characterize academic learning in particular disciplines.

The present study was designed to begin to address such concerns, focusing initially on conceptions of the subject matter of particular disciplines as they are presented in the theoretical and pedagogical literatures, and later on how the subject matter is treated by a range of high school and college teachers. In each phase of the study, we focused our analyses on notions of knowing and the language used to talk about them.

Chapter 2

The Study

This study was organized around two strands. The first strand involved a literature review of discipline-based writing that focused on knowledge in biology, American history, and American literature, and also a review of recent pedagogical literature in the three fields.

The second strand involved a series of interviews with 48 high school and college teachers in those disciplines in order to discuss teaching in their fields -- in particular what counts as learning, and the ways in which they identify that learning. In strand 2, we hoped to trace the threads of the focus on "the process of thinking" that we found in the discipline-based and pedagogical literatures at both the high school and college levels. We wanted to see how the focus on content and structure -- or on ideas and ways of thinking about those ideas -- played themselves out in the teachers' language.

Strand One: Notions of Disciplinary Knowledge

Activities in strand 1 involved investigation of the scholarly and pedagogical literatures on knowledge and learning in the three disciplines, and included a synthesis of the ways in which major scholars (and movements) in each field describe ways of knowing in that discipline, and ways in which authors of articles in educational journals particular to each discipline write about the goals of education and ways of knowing. Sources here included both general works in the philosophy of each discipline and works which present approaches and recommendations about discipline-specific teaching and learning.

Activities

The tasks in strand 1 involved literature reviews. Six research assistants participated in this phase of the work; two were assigned to each particular subject area, communicating and collaborating along the way. To begin their review of the scholarly literature, they interviewed professors of the particular disciplines to help them focus on "major works" and "major issues" in each field. This list of recommendations served as the initial points of entry, after which each text led to another. For pedagogy, the major subject area teaching

journals were reviewed (e.g. those published by national associations in English, science, and social studies.)

Analyses

While the research assistants investigating each subject met almost daily over the course of six months, the entire project team met on a weekly basis in order to discuss work in each field, identify issues within and across works in each field, and to begin to identify and consider patterns of similarity and discontinuity across fields. At the end of the first academic year, drafts were prepared bringing together the themes, issues, and patterns that emerged regarding the ways of knowing from both the scholarly and pedagogical literature in each of the three disciplines. Comparisons across disciplines were arrived at by analyzing themes across the papers, and by referring to the patterns developed and supported across time during the weekly debriefing sessions.

Strand Two: Studies of High School and College Teachers' Conceptions of Learning in Their Subject Areas

Activities

Strand 2 sought to articulate characteristics that differentiate effective performance in the three target disciplines: biology, American history, and American literature. We asked teachers about the nature of the subject-specific content valued by each discipline and how that content is typically realized in oral and written discourse-- that expected of the students or reflected in their textbooks. We compared and contrasted the high school and university teachers' notions of their disciplines and their pedagogical goals, as well as their different conceptions of "good" and "poor" student papers and their differing ways of judging students' learning. Similar comparisons were also carried out across subject areas.

Participants

The 48 high school and college teachers who participated in this strand were nominated by their department chairs, other teachers and colleagues, or administrators based on the following criteria: 1) at least 5 years of teaching experience, 2) a reputation for excellence in teaching the particular subject, and 3) academic specialization (at undergradate or graduate level) in the subject. General characteristics of the participants, and their distribution by discipline and level, are summarized in Table 1.

TABLE 2.1

Participants

	Biology		History		Literature	
	High School	College	High School	College	High School	College
Sample size	8	8	8	10	6	8
Highest degree						
Bachelors	1	0	1	0	2	0
Masters	7	0	7	0	4	0
Doctorate	0	8	0	10	0	8
Years since highest degree						
Mean	14.6	21.8	19.7	15.2	12.7	22.6
(SD)	(8.5)	(11.9)	(15.5)	(6.9)	(8.7)	(7.6)
Professional journals read regularly						
Teaching journals						
Mean	1.0	0.0	1.1	0.0	2.3	0.0
(SD)	(1.2)	(-)	(2.1)	(-)	(.5)	(-)
Content journals						
Mean	1.9	5.8	1.8	3.6	0.0	3.1
(SD)	(1.6)	(1.5)	(2.8)	(3.4)	(-)	(2.6)

All but 4 of the high school teachers had a master's degree or higher, and all of the college teachers had completed a doctorate in their field. All of the participants were well-established. The high school teachers had completed their highest degree an average of 16 years before participating in the study; the college teachers, 20 years. All were professionally active, maintaining memberships in their discipline-based professional associations and regularly reading professional journals. For the college teachers, this journal reading tended to focus on the content of the discipline; for the high school teachers, it was more likely to focus on the associated pedagogy.

Materials

The project team developed two interview schedules and a questionnaire, designed to reveal the teachers' a) general background both in their subjects and in teaching; b) general conceptions of effective learning in their courses; and c) notions of salient features of effective (or ineffective) student writing.

The teacher questionnaire was designed to gather a variety of background information that could be elaborated upon if necessary during the course of the interviews. Questions focused on 1) college or university coursework in their major area as well as in education; 2) other significant influences on what or how they taught; 3) professional activities (memberships and reading); 4) organization of topics in courses taught; 5) selection and use of textbooks and other materials.

The first interview schedule focused on background information and on teachers' general conceptions about teaching and learning in their subject area. Specific areas addressed included: 1) courses currently taught (titles, grade levels, organization, enrollment; 2) conceptions of the discipline (importance of the subject, things all students should learn about the discipline, kinds of knowing expected from students, role and treatment of controversy within the discipline, currently popular approaches), 3) expectations for particular courses (assumptions about entering students, what students should learn by the end of the course), and 4) general discussion of what it means to "know" literature, history, or biology.

The second interview schedule was designed to examine how the general approaches and philosophy described during the first interview worked their way out in the context of the planning of specific units and the evaluation of student work. Each teacher was asked to discuss in detail the content, goals, and procedures in a particular unit of study, and to compare and contrast two pieces of student writing from their class, one that represented "good" and the other "poor" student performance for that course. Questions during the interview focused on: 1) specific goals for the unit; 2) content covered and approaches used in the unit; 3)

methods of assessing what students had learned in the unit; and 4) strengths, weaknesses, and areas of potential growth reflected in particular student papers.

Copies of the questionnaire and interview schedules are included in the appendix to this report.

Procedures

After agreeing to participate in the study, project participants were asked to complete the background questionnaire on their own. Two hour-long interviews were then scheduled with each participant. The first interview focused on the teachers' general conceptions of teaching and learning, as it was reflected in the general goals of instruction in their particular discipline, in their previous training, and in their own particular philosophy of education. At the end of the first interview, they were asked to select two sets of materials to bring with them to the second interview: 1) a unit of study from a current course, and 2) two pieces of student work from that unit -- one they considered an example of good and the other an example of poor writing. The second interview focused on these, exploring the goals and objectives of the unit, the ways those goals were carried out, and the kinds of criteria brought to bear in evaluating student performance. Both interview sessions were tape recorded to allow for later content analysis.

Analyses

Responses to the 48 background questionnaires and about 100 hours of discussion were available for analysis across subject areas, level of teaching (high school, college), and focus of the interviews (general conceptions, specific units, student writing). Transcriptions were read carefully to discover consistent patterns, and several content analyses were conducted.

Some of the content analyses focused simply on the various different types of responses that were elicited in response to each question. Others looked more globally at the concerns reflected in each set of responses. These concerns varied somewhat from question to question, but three major emphases occurred consistently and were examined in a variety of different contexts. These were 1) emphasis on specific content that was characteristic of a particular subject, 2) emphasis on the importance of thinking, problem-solving, or the use of evidence to make a case for a particular interpretation or conclusion; and 3) emphasis on activities, content, or approaches that would "engage" or "interest" particular groups of students. To assess each teacher's degree of emphasis on these three areas, scales were used to rate the emphases reflected in each set of related questions. These scales ranged from 0 [no attention to this concern] to 5 [consistent, major emphasis]. Ratings were made on the basis of emphasis and concern expressed by the teacher in

a particular context, and did not necessarily require an elaborate or well-developed vocabulary for discussing each emphasis. To capture the degree to which an emphasis was articulated, teachers were also rated separately on the degree to which their concern with content and with ways of thinking was well-articulated. These scales also ran from 0 [unarticulated] to 5 [well-articulated concern reflected in an extensive set of concepts used to discuss this area].

Correlations between independent ratings of 50% of the responses indicated interrater agreement ranging from .80 to .92 across various scales.

Preview

Chapters 3 through 5 will present synopses of each subject area literature review, and will discuss their implications for beginning to understand the interrelationships among language, knowledge, and the structure of understanding in each field. Findings from the analyses of teacher interviews will be presented in chapter 6. The final chapter will present a review of major findings and suggest the next steps in a research agenda that can relate these findings to instructional reform.

Chapter 3

Theory and Pedagogy in Biology

Elise Ann Earthman

To more fully understand concerns about the ways of thinking in biology, our review of the literature took us to works in the general area of science as well as to those in the particular sub-field of our interest. From the readings, it was readily apparent that for thousands of years--since the days of Plato and Aristotle--philosophers have been trying to elucidate the nature of scientific inquiry, to describe what is unique about scientific thinking. And although they may have argued about its exact characterization, until quite recently most scholars would have agreed that a "scientific method" exists and is practiced by those engaged in research in various scientific fields. However, the very nature of scientific thought, inquiry, and truth have been in question throughout the twentieth century, and our goal in this review of the literature was to to be able to describe the predominant theoretical and pedagogical thinking, to discover whether the major concerns are similar or different, and to learn whether pedagogy has been informed in a meaningful way by theory.

Theory in the Academic Discipline of Biology

Several levels of theory are relevant to the discipline of biology. The uppermost level of theory is that of the philosophy of science, where we find discussions of the scientific method, the social aspects of science and other epistemological issues. Below this is a level of theory specific to biology at which questions relevant to the philosophy of biology are discussed. At the most basic level we find researchers formulating theories within the frames of particular biological investigations.

The last 60 years have seen major changes of perspective in the philosophy of science that affect ways of thinking in biology as well as in the physical sciences. During the 1920's in Vienna, a group of scientists and philosophers formed a powerful group (the "Vienna Circle") to consider epistemological questions relevant to the process of scientific inquiry; this group, which came to be known as the "logical positivists," was extremely influential in its own time and continues to influence thinking in science today.

The logical positivists' purpose was "to give a general

account of the structure of scientific theories, supposedly grounded in empirical basic statements with the help of rigorous logic" (Oldroyd, 1986, p. 234). They sought to form a unified science, one firmly rooted in logic and empiricism which contained no metaphysical component. Believing all science to be ultimately reducible to physics, they tried to identify basic statements or protocols (literally, "first statements"), derived from actual observation, that could be used as a foundation for scientific knowledge. Critical to the logical positivists was the principle of verifiability, which states that meaningful propositions are of only two types, those that are logical and those that are empirically verifiable, and that any validation will be cast in terms of basic observation statements derived directly from sense experience. The principle of verifiability led Bridgman to the idea of operationalism, which states that "any concept . . . is synonymous with the corresponding set of operations" which determine the concept (Bridgman, 1927, p. 5); for example, "the concept of length involves as much as and nothing more than the set of operations by which length is determined" (Bridgman, 1927, p. 5). A main goal of the logical positivists was to establish an "empiricist language" through which scientific laws and theories might be expressed but from which metaphysical propositions would be excluded.

Challenges to the logical positivist position were not long in coming, the first and foremost from Karl Popper (1959), who took issue with the notion of verifiability. Concerned, as the logical positivists were, with conferring a special status on scientific inquiry, Popper sought to differentiate between science and pseudo-science but believed the principle of verifiability to be inadequate. Popper stated that "our main concern, in science, is, or ought to be, the search for truth" (1972, p. 319), but what is our criterion of truth, how can we prove a theory true? Arguing against the inductive method, which draws conclusions from a body of evidence, Popper pointed out that no matter what the weight of evidence in favor of a theory, we may never argue that it is "proven," for we can never rule out the possibility that future evidence will ultimately refute it. He therefore developed an alternative to the principle of verifiability, called the criterion of demarcation, which states that "the criterion of the scientific status of a theory is its falsifiability, or refutability, or testability" (1980, p. 23). Thus to Popper, a scientific theory is one which can be proven wrong, not right; the theories of pseudo-scientific disciplines, such as psychoanalysis, cannot be falsified and therefore have not achieved scientific status.

How does science, then, move toward the truth? According to Popper, by a process of conjecture and refutation, for scientific theories are "inventions--conjectures boldly put forward for trial, to be eliminated if they clashed with observations," if a "decisive refutation" were obtained (1963, p. 16). What will begin to establish a theory as likely true is if it is corroborated--that is, over time it has stood up to rigorous

attempts to falsify it.

Another challenge, this time directed toward the logical positivists' notion of objective observation, came from Hanson (1958), who argued that theory influences what is observed, and further, that there is no such thing as a "fact" without a prior theory. In the absence of a pre-existing conceptual scheme, what constitutes a fact? When we observe a particular phenomenon, what should we perceive as relevant? And since theory influences perception at a fundamental level, Hanson holds that two observers who believe in different theories will look at the same data and "see" different things. Thus, according to Hanson, objective or neutral observation simply does not exist; all observation is "theory-laden."

Other scholars have raised questions about whether, in fact, science has "rules" of the type sought by logical positivists, and even whether it is a rational endeavor. Kuhn (1970), a historian of science, takes a sociological view; he argues that individual scientists work in communities governed by a particular paradigm, an established model for their particular branch of science that functions as a world-view, a way of knowing the world, into which new young scientists are socialized. When a paradigm becomes established, a period of "normal science" will occur, in which the main activity is "puzzle-solving"--scientists agree on the problems to which they should attend, there are few experimental surprises, anticipated favorable results materialize, and any unfavorable or inexplicable results are suppressed or dealt with in an ad hoc fashion. But at some point enough anomalous results have accumulated to undermine the paradigm, and the weight of these results finally topples it, at which point a rival paradigm takes hold and the cycle begins again. Additionally, Kuhn makes the point that paradigms are "incommensurable," that scientists in one paradigm cannot communicate with those in a rival paradigm, and that the rival theories cannot be compared with one another.

Feyerabend (1975) takes a more radical position than Kuhn, arguing that there is no privileged method of scientific inquiry at all, that science is basically anarchic, employing many different methods, no one of which is more suitable than another. Taking issue with the idea that science is rule-governed, he points out that "there is not a single rule, however plausible, and however firmly grounded in epistemology, that is not violated at some time or another" (p. 23). He suggests that new ideas in science are often seen as "irrational," against the background of established thought, and that progress in science is therefore firmly connected to irrational acts. If this is the case, no particular way of thinking is privileged, which if true, invalidates the positions of both the logical positivists and Popper.

These challenges to the traditional view of science have not themselves been unchallenged; most recently Scheffler (1972; 1982) and Siegel (1982, 1985) have sought to reestablish the

ideal of objectivity and rationality in scientific endeavors. But a shift in thinking has occurred, and the traditional foundation of science has been undermined; Phillips (1985a), for example, points out that "it is now widely regarded as untenable to hold that scientific theories are built up from a foundation of secure, unquestionable, objective and theory-neutral observation" (p. 39).

If we move below the level of theory as it applies to all scientific disciplines, we find a number of discussions specific to the philosophy of biology itself. For example, theorists at this level consider whether biology is in fact reducible to physics or whether it occupies a special position within the scientific disciplines; part of the argument in favor of biology's uniqueness is its use of teleological explanations, or those which make reference to ends or purposes. Philosophers of biology also discuss questions related to evolutionary theory and to taxonomies, classifications, and systems.

A main tenet of logical positivism is that all science is ultimately reducible to physics; in recent years this issue has been intensely debated within the field of biology. The most extreme advocates of reductionism believe that the reduction of biology to physics is not only possible but that the branch of biology that will lead most quickly to that end--molecular biology--offers, in fact, the only worthwhile avenues of research to pursue. At the opposite extreme are those who believe that biology will never be reducible to physics, since there are important biological problems that are not--and cannot be--addressed by molecular biology.

Anti-reductionists argue that the type of systematization found in the organic world marks a complete differentiation of living things from non-living; reductionists such as Pattee (1971) and Schaffner (1976) argue that biology is merely a complex version of what is found in physicochemistry. Schaffner notes that "biology studies highly organized historically evolved chemical systems . . . nowhere is there any evidence that there is something unique to these systems--something that would make biology an autonomous science that was irreducible to physics and chemistry" (pp. 120-1). Reductionists, whose position has been strengthened by the elucidation of the DNA molecule by Watson and Crick and by subsequent advances in molecular biology, point to the complete accounting of the chemistry of the hemoglobin molecule as an argument for the possibility of reduction (Rosenberg, 1985).

Anti-reductionists such as Polanyi (1968) view the example of Watson and Crick's discovery differently. Polanyi argues that the characterization of the DNA molecule clearly shows that it provides "boundary conditions," a blueprint for development for a growing organism, which cannot be explained in terms of physics since such conditions do not exist in the physicochemical world. Believing that "irreducible higher principles are <u>additional</u> to the laws of physics and chemistry" (p. 134), Polanyi offers the

example of dispersed individual embryonic cells which, when brought together, will reform and grow. Eccles (1974), who as a neurobiologist agrees with the necessity of explaining neurological mechanisms in terms of physics and chemistry, nevertheless notes that the process of reduction cannot solve "the brain-mind problem"--how can we account for the consciousness that arises from the neural architecture of the brain?

In addition, anti-reductionists consider the role of natural selection and evolution in biological systems, which is again unknown in the physicochemical world. Dobzhansky (1974) points out that evolution is directional and contains an element of progress, in that directional change generally leads to improvement of some kind, and that this cannot be accounted for in terms of physics. Hein (1971) notes that biological organisms display purposiveness, in the sense that when one avenue is blocked, they will take another; they adapt to a changing environment. This adaptation is not only goal directed, but "modified as the goal becomes more or less accessible or as impediments interfere with direct access to it" (p. 161). Such behavior is referred to as teleological in that it involves aims or ends, and many biologists argue that the fact that they must resort to teleological explanations constitutes "a crucial difference between physical science and life science" (Rosenberg, 1985, p. 45) and makes the reduction of biology to physics ultimately impossible.

Teleological explanations may focus on a biological structure's function or purpose or may refer to an organism's intention or goal-directedness; such explanations are seldom, if ever, used in the physical sciences. Although it seems quite natural in biology to state that an animal has ears for the purpose of hearing, or that the function of the hemoglobin molecule is to carry oxygen in the blood, "it would be quite meaningless to say that hydrogen exists in order to combine with oxygen and make water or that the function of hydrochloric acid is to combine with an alkali to make a salt" (Ruse, 1981, p. 89). Many biologists (e.g., Rosenberg, 1985; Ayala, 1976) believe teleological explanations to be indispensible to biology, for they cannot be reformulated in non-teleological terms. Hull (1974) points out that teleological systems have qualities that non-teleological systems do not; they have goal-states or preferred states that occur much more often than others and they respond to negative feedback. Teleological systems result from natural selection, which Ayala argues is itself teleological "in the sense that it produces and maintains end-directed organs, when the functions served by them contribute to the reproductive efficacy of the organism" (1976, p. 324).

A number of scholars, including Hein (1971), Hull (1974), and Ruse (1981) have argued that the questions of whether teleological or non-teleological explanations should be used, or whether molecular biology is more important than the study of ecological systems are ultimately irrelevant, because the kinds

of explanations that biologists use will be those that turn out to be the most fruitful, no matter what type they are. Teleological models may provide useful heuristic guides in one situation, while molecular explanations couched in physicochemical terms may be appropriate in another. But it appears that it will be quite some time before biologists will be ready to abandon teleological explanations, and also before molecular biology will be able to provide many of the answers to questions now being investigated.

Another discussion in biological theory or philosophy focuses on the nature and classification of species. Many biologists believe that systematics, the branch of biology that deals with classification and taxonomy, is fundamental to all other studies within biology; Mayr (1976) has noted that "an inventory of the species of animals and plants in the world is the base line of further research in biology" (p. 353). Rosenberg (1985) argues that the ultimate goal of systematics is to provide "the biologist with a 'periodic table' at least as suggestive and exact as the one Mendeleev provided chemistry" (p. 181). But a problem lies in the fact that there is currently no agreement on a definition of the term "species," or on what conditions a group of organisms must satisfy in order to constitute a species.

A number of different systems have been proposed. Those who practice phenetic taxonomy (e.g., Sokal and Sneath, 1963; Colless, 1967) believe that it is possible to develop a theory-neutral operational definition for specifications of species, one which is based on objectively observable properties. This has been questioned by Rosenberg (1985), among others, who points out that since every organism has an indefinitely large number of traits, the very process of deciding which are significant must be theory-based. Mayr's system (1942, 1976) is based on reproductive isolation: "Species are groups of actually or potentially interbreeding natural populations which are reproductively isolated from other such groups" (1942, p. 120). This system develops problems when it tries to explain hybridization and asexual reproduction. An evolutionary perspective on taxonomy sees a species as "a lineage (an ancestral-descendant sequence of populations) evolving separately with its own unitary evolutionary role and tendencies" (Simpson, 1961, p. 153). Thus each species is identified in terms of its descent from prior species. But the evolutionary species system presents difficulties in defining what a "separate lineage" is, for it is possible to have "two distinct lines of descent in the same species and two lines of descent that are separated in distinct species" (Rosenberg, 1985, p. 197). The ecological species view holds that a species is an organism that occupies a particular niche within an ecological zone, drawing a connection between the organism and its environment. But "niches" or adaptive zones are extremely difficult to identify, and also the existence of one species in a niche may be dependent upon other species being present. A "radical" new theory holds that species are not classes at all but individual objects of which its

members are parts (Ghiselin, 1974; Hull, 1976; Gould, 1982). If this is so, species do not require definition, any more than does an individual work such as the Mona Lisa (Rosenberg, 1985).

Throughout the discussion of philosophical questions in biology run constant references to the theory of evolution and to natural selection; it appears that the formulation of an answer to any problem within biology must take evolutionary theory into account. Rosenberg (1985) believes that biology will ultimately prove irreducible to physics because of evolution:

> . . . the disjunctive character of biology is a reflection of the operation of general evolutionary laws. . . it is to them that we must trace the persistence of teleological attributions in functional biology; it is to them that we must trace the ineliminable biological elements in even the most chemical explanations of biological processes . . . it is to them that we must trace our inability to provide an account of the notion of species that will link taxonomy with biological theory and therefore with the rest of science (p. 223).

Thus it appears that biology's uniqueness rests in evolutionary theory, its foundation and, according to Rosenberg, its only true law.

At another level of theory we see major formulations of theoretical ideas that apply to specific areas of biology. These include theories of the mechanism of evolution (including theory of natural selection and the synthetic theory, which combines Darwin's original theory with that of genetic transmission), cell theory (including theoretical notions about the structure, formation, function, and growth of cells), and various biochemical theories (such as those relating to enzymes, to glycolysis, or to the role of DNA in chromosome duplication). These major theories provide frameworks for individual research projects, at which the final level of theory is found, that which guides investigation in very narrow fields, where researchers may be hypothesizing about the mechanism by which synapses in the brain are modified by experience (Bear, Cooper & Ebner, 1987), or about why we see particular patterns of environmentally determined sex in reptiles (Head, May, & Pendleton, 1987).

Thus biologists apply theory in their discipline at a number of levels, from very high-level philosophical questions about the nature of scientific investigation to particular questions about the nature of biological study, to large-scale theories within the field itself to smaller theories that guide their day-to-day research. The major philosophical questions appear to center on the objective/subjective dispute common to many fields in the late twentieth century, which has a direct impact on the conduct of research within scientific fields, and on whether it is now--or will ever be--possible to reduce biology to physics, a

discussion that has contributed much toward clarification of what is characteristic of and truly unique about biological study.

Pedagogy in the Academic Discipline of Biology

Because there is no pedagogical journal specifically directed to college biology teachers, it is difficult to make a clean separation between high school and college biology in the pedagogical literature. In this section it will be made clear wherever possible what contrasts exist between high school and college biology teaching. We will now consider the history of biology teaching, current areas of concern at both the high school and college levels, and the question of whether we see a connection between theory and pedagogy in the academic discipline of biology.

Hurd (1961) has chronicled the growth of high school biology from the turn of the century to the dawn of the space age in the late 1950's. Prior to 1900 few high school biology courses existed; students studied botany or physiology. Courses focused on preparing students for college entrance exams through work in the laboratory, with attention to the morphology or structure of organisms and to the students' expressing themselves "clearly and exactly by words or by drawings" (p. 12). Biology as a unified course developed by 1910 and began to become popular as interest in the older courses waned. The purpose of biological study was seen less as preparation for college (Bybee, 1977), or development of "mental discipline" and more that of engaging student interest and offering them practical benefits. Interestingly, a report of the Central Association of Science and Mathematics Teachers in 1910 made several recommendations that sound remarkably contemporary: that biology courses should emphasize "reasoning out," rather than memorization, that students should be helped to develop "problem solving" and "problem-raising" attitudes, and that greater emphasis should be placed "on the incompleteness of the subject and glimpses into the great questions yet to be solved by investigators" (Hurd, 1961, p. 26).

By 1920 biology teaching was firmly focused on practical applications; students studied vocations within biology, health and sanitation, hygiene, and ecology. Hurd (1961) notes that, because of this practical focus, "the research biologists and the high school biology course parted company at this point" (p. 39). Although courses were organized around problems and projects in the hope that students would become familiar with the methods of science, laboratory work was criticized at this time as being uninteresting and unrelated to what was going on in lecture. During the 1920's, a period of increasing enrollment in biology courses, numerous writers recommended that attention be turned from specific organisms to biological principles, but little change was seen even in texts that purported to be based on principles. At this time also, scientists urged that students of

science learn the nature of science, its methods, and its attitudes, and educational research began to be conducted in this area.

This was followed by a period in which curricular objectives were formulated; they included emphasis on problem solving rather than memorization, on inculcating students into the scientific method, on defining content in terms of principles and generalizations within the field (rather than studying individual organisms), on a unified focus for lecture and laboratory. Hurd points out that although these and other objectives became "standard" in lists of objectives for biology teaching, they resulted in little actual change within the classroom itself, in which teachers continued to focus on facts. Also at this time, many high schools eliminated individual laboratory work, replacing it with teacher demonstrations; it was felt that time and money were saved, since research showed that the student could learn "facts" by either method.

During the years of the Second World War, attention in biology courses turned to preparing students for positions in technical fields. At this time also, biology courses began to take on a social science perspective, as attention turned to how scientific knowledge is applied in the world in terms of such areas as health practices, conservation, and sanitation. A committee that surveyed high school biology teaching in 1942 reported that teachers tended "to teach biology not as a science, but (a) as a way to pleasing hobbies, or (b) as a series of practical technologies" (Hurd, 1961, p. 81); Hurd comments that "the status of science in the secondary school curriculum was never weaker than at the start of this period (1940)" (p. 106), and by the end of the decade the developments during and following World War II pointed to the need for a solid science curriculum.

This growth in science and technology contributed to a "crisis" in science education during the period 1950-1960. A major area of discussion centered on how to incorporate the growing volume of scientific knowledge into the high school curriculum, how to keep it current with scientific progress and how to turn out individuals with technical training in the sciences (Helgeson, Blosser & Howe, 1977). The discipline also faced a serious shortage of qualified teachers; during the 1950's as enrollments in science courses increased, the number of college science majors who went into teaching decreased each year. New teacher training programs were developed in the hope of attracting young teachers with promise. Within biology, courses began to be organized around interpretive themes such as ecology or evolution. Recommendations for the improvement of laboratory work included use of the experimental approach, the addition of field work, and a focus on the study of living organisms. The National Defense Education Act, passed in 1958, assisted schools in the purchase of laboratory equipment and reference books.

A key article that had great influence in all areas of science teaching was "The Teaching of Science as Enquiry" by Joseph Schwab (1962). Schwab, a major figure in the curricular reform movement in science education during the "crisis" that followed the launching of Sputnik in 1957, identified two kinds of scientific inquiry which alternate over time: periods of stable inquiry, during which knowledge is accumulated to support already established principles (similar to Kuhn's "normal science") are followed by periods of fluid inquiry, during which new principles are developed. Schwab contends that the amount of fluid inquiry has dramatically increased during this century, and that scientific knowledge is rapidly undergoing revision and reorganization. Science teaching that focuses on science as a fixed body of knowledge--in Schwab's term, a "rhetoric of conclusions"--leaves students unprepared to take their places as either the fluid enquirers of tomorrow or as informed citizens who will understand and lend their support to the goals of science. Schwab advocates a curriculum that would "invite students to discover the limitations of present knowledge [and] identify unsolved problems and areas of present ignorance . . . to invent, to devise and explore possibilities alternative to current formulations" (p. 39).

What became known as the inquiry method served as a focus of curricular development in the 1960's. The Biological Sciences Curriculum Study (BSCS) group developed experimental textbooks (identified as "Green," "Yellow," and "Blue") which emphasize biology as a process of inquiry and which are organized around conceptual themes and integrative concepts. Each version has a different focus: The Green version takes an ecological perspective, the Yellow a genetic-evolutionary perspective, and the Blue a "linear" approach, beginning with the basis of life in matter and moving to the level of organs and then to the whole organism. Later editions of these texts are still in use today.

The most recent report on the status of biology teaching at the high school level is by Hurd, Bybee, Kahle, & Yager (1980), who comprised the biology team of a research group who synthesized and interpreted the results of surveys done by the National Science Foundation (Helgeson, Blosser, & Howe, 1977; Stake and Easley, 1978; Weiss, 1978) and by the National Assessment for Educational Progress (1978). They determined that "knowledge [imparting facts, concepts, and principles] has been and remains the dominant goal of biology teaching" (p. 391) at the present time. Although the inquiry method is much-discussed, teachers, who do not feel competent to use it and who believe it benefits only gifted students, lecture more than 75% of the time. According to Hurd et al. (1980), teachers who have used inquiry learning have limited their attention "to specific skills such as observing, hypothesizing, and experimenting" (p. 393). They recommend that this list be expanded to include twelve more advanced skills, which include an understanding of risk and probability; knowledge of holistic, ecological, or systemic thinking; problem resolution as opposed to problem solving; and understanding of sources and reliability of information. There

is a trend toward recognizing the importance of environmental issues and societal problems, but little emphasis is given to fulfillment of students' personal needs through knowledge of biology or to informing them of career possibilities within the field.

Hurd et al. (1980) point out that high school biology teaching is extremely textbook-oriented, with only three textbooks being used in over two-thirds of biology classes at the high school level (the BSCS Green and Yellow are two of these three texts, but they are used much less often than a text entitled Modern Biology which does not focus on the inquiry method). In essence, the biology textbook determines the curriculum; teachers rely on it to provide a framework for the knowledge and skills that they teach. Stake and Easley (1978) report that 90% of high school science teachers use a textbook 90-95% of the time. This extreme reliance on the textbook to organize a course has led Hurd et al. (1980) to comment, "The teacher and a single textbook are more important than any curriculum materials or curriculum design in determining the focus of biology education in the secondary school of the United States" (p. 395).

Until the 1950's, attention to biology teaching at the university level was directed toward the preparation of professionals within the field. Particular attention was paid to providing students with course content that would lay a foundation for further education, since many students in the sciences enrolled in either graduate school or medical school (this has not changed: the figure was around two-thirds in the early 70s) (Doty and Zinberg, 1972). As a result, course offerings were "increasingly devoted to the specialized education of scientists" (French, 1952, p. 18).

Following the explosion of scientific knowledge that occurred after World War II, concerns about biology teaching at the college level developed in two general areas: first, how to keep pace in the classroom with new developments in the field, and second, how to develop "scientific literacy" in the general public, so that scientific researchers would be able to acquire the broad public support necessary to ensure financial support of their research programs.

Advances in molecular biology of the late 1950's and early 1960's led to increased attention in the classroom on the molecular and cellular levels, and the traditional organizing principles for a biology class--morphology, taxonomy, and phylogenetics--were quickly replaced with principles of heredity, cytology, and evolutionary dynamics. But it soon became clear that the enormous content generated by scientific advances in molecular biology simply could not be covered in an introductory class; at the same time criticisms were heard that such an exclusive focus on the molecular level was reductionistic (Wert, 1982). It was also noted that those who are educated in what is

most current in science do not stay current for very long; Doty and Zinberg argue that "the greatest overall threat to a science education that aims to remain viable and useful for a long time is that it will succumb to the temptation of being current" (p. 694). The late 1960's and 1970's brought a concern with the social implications of biology and discussions of these issues were increasingly included in classes.

Because of the interest in the development of scientific literacy in the general public, non-majors became a focus of attention and special courses were developed for them. Wert (1982) notes that non-major courses had several purposes: to acquaint students with the field and provide an overview, to familiarize them with how scientists work and help them to apply such methods to the solution of their everyday problems. He contrasts this with the aim of introductory courses for majors, which demonstrate a preoccupation with covering a given body of subject matter.

At the present time, the teaching of biology at the college level seems to suffer from a lack of direction and organization (Blystone, 1987). Schemes for organizing courses have proliferated; courses may be organized around evolution, or the "whole organism," or around introducing students to inquiry (more popular in the 1960s than now) or to the scientific method. Wert (1982) points out that many courses are organized around textbooks and, unlike the situation at the high school level, the large number of textbooks available for college biology leads to a lack of curricular focus.

Most introductory college level biology courses concentrate on transmission of facts. Moore (1984) suggests that there are several reasons for this: 1) facts are easier to teach than concepts; 2) extremely large class size lends itself to fact teaching and objective testing; 3) premedical students who dominate first-year courses for majors insist on learning the facts they will need to know for medical school entry examinations; 4) young instructors who have just completed a "fact-laden, concept-poor science curriculum" (p. 35) may know no other way to teach. Thus we note a marked similarity between biology classes at both the high school and college levels, which appear to be extremely text-centered and devoted to the transmission of a large body of fixed knowledge.

What issues currently interest high school and college biology teachers? Is there evidence of any concern about the current foci of biology teaching? An examination of recent pedagogical literature reveals what biolgy teachers are thinking about now.

Textbooks are of interest to both high school and college teachers; there appears to be agreement that biology textbooks at both levels present problems. At the high school level, Carter (1987) has expressed a number of concerns, primarily that

the content of high school biology textbooks is subject to a number of influences "unrelated to quality science education" (p. 425). He points out that because the textbooks of 22 states are chosen at the state level, publishers feel the need to be aware of what those states, particularly the most populous ones, want in their textbooks. Since most of these states (17 of the 22) are southern states in which textbook committees are under pressure from conservative groups, publishers inevitably bring out texts that are as inoffensive to those groups as possible. As a result, textbooks regularly omit discussion of human sexuality, human behavior, and human evolution. Other influences on textbook content also exist. Carter notes that the recent "dumbing down" of textbooks in all areas has affected the quality of biology texts. Schools' financial problems affect textbook purchases; because many school districts retain the same texts for seven or eight years in order to save money, the information in them on modern biology is no longer current. He also points out that university science professors are as a rule not rewarded for writing textbooks, and those who do often find their submissions altered by publishers who are trying to achieve maximum sales.

A major problem with textbooks for both high school and college is their extreme preoccupation with specialized terminology; since teachers at both levels tend to rely on the textbook more than any other curricular material, it is not surprising that transmission of knowledge becomes the focus of a course. Yager (1983) has demonstrated that the typical science course "require[s] students to master more new words than would be typically required in studying a totally new language" (p. 584). He notes that the literature on foreign language teaching suggests that students learn between 1000-3500 new words per year, with the smaller number more appropriate for introductory levels. In contrast, the number of technical/specialized terms in high school biology texts, typically used at the tenth grade level, ranges from approximately 10,000 (BSCS Yellow) to 17,000 (Modern Biology). Yager wonders whether this overemphasis on words might explain the fact that biology students are often unmotivated and show little interest in the subject, and also whether teachers' overreliance on the textbook with its enormous vocabulary to be mastered masks their own limitations in and lack of understanding of their subject.

Jungck (1985) has raised another important point concerning science textbooks, including those whose subject is biology: they depict science only as it is carried out under Kuhn's (1970) "normal" paradigm, and thus do not introduce students to the nature of fluid scientific inquiry, which is becoming the norm (Schwab, 1962). He points out that, among other things, "textbooks rarely devote much space to helping students understand (1) why earlier scientific conceptions are incompatible with our observations, (2) how to solve problems, (3) what heuristics (not the so-called scientific method) are generally useful in recognizing types of and approaches to problems . . . " (p. 264). Such texts clearly do not contribute

to students' understanding of the nature of scientific inquiry.

Blystone (1987) criticises the lack of research concerning college level texts, and argues that because there is no national collegiate biology curriculum with guidelines about what content should be included at what levels, college biology textbooks tend to be encyclopedic compendiums of information (they average over 1200 pages and six pounds in weight). Blystone points out that since publishers want college texts to be "current," the books frequently are loaded with "state of the art terms . . . sprinkled like seasoning to whet the appetite of fellow professionals" (p. 421), terms that often remain undeveloped and without contextual orientation. He urges discussion and research that will lead to the development of more useful and effective texts at the college level.

The pedagogical journals in biology have published a number of articles in recent years that show evidence of a growing concern with inquiry and thinking skills in biology classes. The teaching of inquiry skills has long been advocated in science courses (e.g., Schwab, 1962; Harms, 1978; Welch, Klopfer, Aikenhead, & Robinson, 1981), but recent evidence shows that the inquiry approach is little used in biology classes (Hurd et al, 1980). Costenson and Lawson (1986) conducted a survey among high school biology teachers to determine why, despite the fact that research has shown it to be effective (Lott, 1983; Shymansky, 1984), so few instructors choose to use it. Teachers argued that inquiry materials are too time consuming to develop, the inquiry-centered class cannot move quickly enough to cover the district curriculum, inquiry books are too difficult to read, students are too immature and waste too much time, teachers cannot adjust to new methods of teaching, and it is simply too uncomfortable for teachers and students to deal with "mistakes" and unsuccessful attempts at reasoning.

Nevertheless, approaches that incorporate inquiry and thinking skills continue to be advocated. In an editorial entitled, "Make Them Think," Wivagg and Moore (1985) suggest that students be informed of the "changing nature of biology" (p. 324), and that their appreciation of this be stimulated by doing laboratory exercises with unknown results, by instilling a certain amount of skepticism in students, by showing students where their textbooks are incorrect, and by stressing "that biological science is a process, not a collection of definitions or a list of dogmas" (p. 324). Jungck (1985) urges that students be allowed to <u>pose</u> problems rather than merely solve those in the back of a textbook. Medve and Pugliese (1986) discuss the process by which we make inferences and the place of inference in logical reasoning, and offer a number of exercises directed at secondary school teachers that will involve students in making inferences of the type that biologists usually make.

Beyer and Charlton (1986), laying the blame for students' lack of critical thinking skills on teachers' failure to teach those skills, offer a method based on research in cognitive

psychology for helping students to develop the ability to classify, a key skill in biology. Their article is particularly valuable in that it presents teachers with a clear, step-by-step strategy for assisting students in the development of that skill, but also makes the point that one lesson is not enough and that students will need "frequent, intermittent, teacher-guided practice" (p. 210), with the amount of guidance gradually reduced, if they are to achieve mastery of the skill. Powell (1987) reports the beneficial results of having high school biology students participate in research projects of their own design; in the case he presents, a team of students investigated the relationship between the Siberian Elm and the Elm Leaf Beetle, a troublesome pest in their environment. Ultimately, this project was covered in the local media and the students' results were forwarded to local and state officials. Although Powell points to a number of benefits for students who carry out a project such as this, including that they will be introduced to scientific research methods and that they will come to understand the value of fundamental science, his use of research projects as a curricular component is puzzling: Students were not required to complete a project as part of their coursework, but participated on a strictly volunteer basis, on their own time, for no extra credit. As a result, when students were asked to volunteer, only 11 students out of 5 classes (perhaps 150 students) agreed to participate. Surely if research projects are worthwhile, they are worth incorporating into regular coursework so that all students might benefit from them.

A number of writers have been concerned with the biology curriculum at the college level. Ost (1987) recommends that students of biology come to understand that "biologic knowledge is tentative and all science is subject to retesting and revision. There are no immutable facts" (p. 154.); he argues that a biology curriculum must reflect this essential nature of science. Scharmann and Harty (1986), critical of nonmajor biology courses which emphasize lower levels of cognitive skills such as memorization by requiring students to master a large body of facts, suggest biology courses which encourage critical thinking skills by providing students with strategies for analyzing, synthesizing, and evaluating the biological content they are learning.

Many of those who believe that students should understand biology as a process or way of knowing center their recommendations for improvement on the laboratory. Medve and Pugliese (1987), pointing to college students' inability to understand the methods used to solve scientific problems, describe a laboratory course in which "content and process . . . go hand-in-hand" (p. 278). In this course, which emphasizes inductive solutions to problems, students would be evaluated only on their "mastery of the processes of scientific inquiry and the application of these problem solving skills" (p. 278). In Rhyne and Golden's (1986) laboratory course, students tackle problems that may have more than one correct answer and they work in an atmosphere in which they are encouraged to take risks without

worrying about failing. Manteuffel and Laetsch (1980), reporting on a laboratory course in which students conduct independent investigations in areas of their own choosing, point out that students accustomed to "cookbook" laboratory exercises may need a great deal of assistance in choosing appropriate problems to investigate and designing appropriate methodologies; they found that peer guidance, instructor involvement and written guidelines were helpful in alleviating some of these problems. Student opinion of such courses tends to be high; Davis and Black (1986) report that students recently enrolled in the course earlier described by Manteuffel and Laetsch (1980) said they had a high interest in experimental research after taking the course and that they had worked harder than in other laboratory courses they had taken. They also felt that the course had significantly improved their problem-solving skills and contributed to their understanding of the scientific process. The large majority preferred it to the standard biology laboratory course.

In none of the above-mentioned articles on introducing students to the scientific process is there any further mention of how students are to convey the results of their investigations than that they ultimately write a short report; indeed, it is striking that in the pedagogical literature at both the high school and college levels in biology there is almost no mention of how students are to learn to organize and present their results in a way that is appropriate to their discipline. Ambron (1987) discusses the use of writing in a class of community college biology students, but the kinds of writing her students do are hardly typical of working scientists: journals, expressive/freewriting, and microthemes--"essays so short that they can be typed on a single 5x8 inch note card" (p. 265). While Ambron is to be commended for her belief in "writing as a unique mode of learning to create meaning and to develop critical thinking" (p. 263), and in its particular value for with nontraditional students who especially need to be able to connect unfamiliar subject matter to their already existing knowledge structures, her goal appears to be something other than helping these students to learn the ways of expression typical of biologists.

Is there any evidence that science teachers in general, and biology teachers in particular, are considering the larger philosophical questions mentioned earlier? Recent years have seen the publication of a number of articles that suggest that this is a growing concern. Phillips (1985b), asking the question "Can scientific method be taught?", concludes that it can but that students should learn a "demythologized" science, one that acknowledges recent thinking in the philosophy of science. Students should learn that observation is theory-laden, that the foundations of science may be challenged, that scientists are human and demonstrate the same frailties as any other members of the human race. Siegel (1985), arguing against the relativistic position of Kuhn (1970), suggests the value of teaching science from a pluralistic point of view, in which diverse ideas and approaches are used; he points out the importance of having

students develop a "sense of the lurching, weaving, and false starts of actual scientific inquiry, and of the tentativeness and fallibility of the results of inquiry" (p. 103). He also notes the value in having students come to understand the ways of presenting evidence and arguing in several different fields, for this will contribute to their abilities as critical thinkers, and argues for the special value of having them become familiar with the scientific way of thinking, "with its emphasis on objectivity, impartiality, honesty, and respect for evidence" (p. 104). Griesmer (1985), using recent developments in the philosophy of science as support, urges that biology instructors not teach "the" scientific method, but rather "discuss questions of method with historical and philosophical sensitivity" (p. 212).

Flannery (1986) points out that it is just as important for nonmajors to develop a sense of science as process as it is for majors. She suggests that students come away from a biology course--which may be the only science course they take--understanding the role of intuition in scientific inquiry, the existence of exceptions to the inductive method, and the notion that facts may be interpreted in a number of ways, that science is an activity carried out in the context of a particular society, and that experiments do not always lead to important--or even meaningful--results. For Flannery, developing a scientifically literate public will not be the result of their having memorized a body of facts but in their having developed some understanding of science as a human endeavor.

Finally, Moore (1984) makes an important point about the place of evolutionary theory in the college biology class. In the first report of an American Society of Zoologists' project entitled "Science as a Way of Knowing," Moore argues that since evolutionary theory is the foundation of all biological sciences, since "evolution illuminates all the rest" (p. 33), it must be the cornerstone of biology courses. To teach evolutionary theory is to teach students the way biologists think, but Moore points out that all too often evolution is relegated to a unit at the end of the course. This position is typically justified with the argument that students must have "a firm basis of biological knowledge" (p. 33) in order to understand the full impact of evolutionary thinking. But Moore suggests that the reverse may be true, that evolution, when considered at several points during a course, can provide students with a framework with which to make sense of the many facts that they are learning.

We have reviewed a number of articles that evidence a concern with whether students are learning biology as a way of knowing as opposed to a body of facts and concepts to be mastered. But is this a major focus within the literature today? An overview of the contents of journals devoted to the teaching of biology reveals the range of topics currently of interest to biology instructors. As previously mentioned, there is no journal at the university level specifically directed to teachers of biology; however, the Journal of College Science Teaching

regularly publishes articles in the subject area of biology. The other pedagogical journal, American Biology Teacher, publishes articles by and of interest to both high school and college biology teachers.

A review of those articles related to biology in the Journal of College Science Teaching in recent years shows that over half (63%) could be labeled as "how-to-teach" articles, with 47% of those specifically directed to laboratory exercises. These usually take the form of step-by-step instructions on how to conduct a laboratory session, sometimes including information on special equipment that will need to be acquired or built. Most of the remainder of the articles devoted to biology in this journal are divided among two additional areas: course descriptions, 13%; and general pedagogical concerns (such as an article on how to keep current with new knowledge in biology), 10%. The journal also has published a few articles on such topics as careers in biology, or on educational research done in biology classrooms.

The content of American Biology Teacher shows a slightly different emphasis. Once again, a large part of the journal is devoted to "how-to-teach" articles (39%), with two-thirds of those focusing on laboratory exercises. The number of these articles has recently seen a dramatic increase; prior to February 1986, the journal published one "How-To-Do It" lab article per issue, but since then the number has jumped to four or five per issue, in a special section of their own. Another large group of articles--in fact, one-quarter of the journal's article content--centers on what might be called "scientific reports or discussions," in which new ideas, theories, and discoveries within particular areas of biological research are presented, presumably for the purpose of helping teachers keep pace with new developments within their discipline. Thus, these articles might present the lastest findings about the immunology of organ transplantation (White, 1985) or on a particular organism such as honey ants (Conway, 1986). American Biology Teacher also publishes reports of educational research in biology (11% of the articles), articles about general pedagogical concerns including those on biology textbooks (8%), descriptions of courses (7%), or biographical/historical articles (6%). A few pieces center on textbooks (3%), bibliographies of resource materials (1%), and careers in biology (<1%).

Thus it appears that the main area of concern of biology teachers is how to teach particular topics within their field, in the classroom and particularly in the laboratory. This interest seems to be increasing, as evidenced by the growing number of articles with a "how-to-teach" format. In addition, biology teachers want to be kept abreast of new scientific developments in their field, undoubtedly with the purpose of updating their own knowledge and their course content.

Teachers of biology at the high school and college levels have long been burdened--or have burdened themselves--with the

task of transmitting enormous quantities of factual knowledge to their students, and despite decades of recommendations that suggest alternate ways of organizing their courses, this situation does not appear to be changing. Though the inquiry method has been much discussed for many years (the 1910 curricular recommendations could be advocating the inquiry method), little progress has been made toward its widespread adoption. Students memorize facts and watch demonstrations or carry out cookbook "experiments" in laboratory courses.

Students are not introduced to the ways of thinking particular to biologists--although evolutionary theory is the foundation of biology, too many students hear about it only at the end of a course or, where creationists are most influential, do not learn about evolution at all. Rather than providing a framework within which students may organize the vast amounts of factual material they must master, evolutionary theory appears as a "unit," a chapter with little explanatory power.

Though recent philosophical revolutions have changed the way many scholars view the nature of science, few biology students become aware of these changes in their classes; rather than learning that biology is a human endeavor carried out in a social context, that "facts" are changeable and "laws" far from immutable, students still leave a course with the image of the objective, rational scientist who daily "proves" theories and adds to our store of irrefutable scientific knowledge.

Most interesting is the fact that almost none of the authors of recent pedagogical articles mentions how students are to learn to structure their arguments in writing. Although those scholars who advocate the inquiry method place much emphasis on the development of higher-level cognitive skills, they have little to say about what evidence students are to give of having mastered these skills, and how students' work in an inquiry class is to be evaluated. While helping students to <u>think</u> like biologists is certainly a step in the right direction, it is equally critical that they be taught to <u>write</u> like biologists, to report their findings and structure their arguments on paper. It appears that little attention is currently given to this area of instruction.

Summary

We might assume that science, with its long history of practice and the large body of philosophical works that surround it, would provide a rich context for the teaching of biology. But even though recommendations have been made for many years that the biology teaching be more "science-like," that students be introduced to the nature of scientific inquiry and thinking, we see little evidence that biology teaching is leaving facts for principles or memorization for skills and process acquisition. The field of history has been undergoing changes that are qualitatively similar to those in biology. These will be discussed and related to instruction in the next chapter.

Chapter 4

Theory and Pedagogy in History

Steven Athanases

Our review of the theoretical literature on historical thought made it apparent that for two thousand years, members of societies have preserved the events of their cultures through recorded history, and these histories serve not only to remind us of the past, but also permit us to reflect on the changing foci of concerns. For instance, the subjects of these histories have varied greatly from earlier emphases on landmark events and a society's elite, to a more recent focus on such social and educational trends as voting patterns and the development of literacy. Methods have varied as much, and the forms of historical reports have ranged from early oral narratives of heroic figures, performed with lute or lyre accompaniment, to recent computerized statistical reports of urban demographics. And as the subjects and methods and products of the historian's work have varied dramatically, so have the purposes. Historians have attempted to instruct, entertain, and forecast; they have sought universal laws of social change; they have worked to both preserve and destroy cultural myths.

Yet despite the many historical changes in the historian's enterprise, the process of inquiry at the heart of historical work has nearly always contained at least three basic parts: What happened? How did it happen? Why did it happen? (Krug, 1967). The historian must investigate, interpret, and analyze. What we read is typically the product of this inquiry, most often in the form of a narrative, and more often yet, in the form of a brief textbook summary of the work. Despite the rigorous process of historical research and analysis, we often meet the historical enterprise in schools as little more than surveys of facts and events. Missing from textbooks, and frequently missing from history classes, are first, the stories of the people that humanize the facts and events reported. But missing also is any treatment of the historian's process of inquiry. Students often meet history as immutable fact, rather than as distilled, somewhat idiosyncratic reports of individuals' inquiries into events, trends, and people.

In this chapter, we will first examine recent thinking about the historian's enterprise. In what ways does recent thinking on what an historian does and ought to do inform the teaching of history? Second, we will briefly survey some recent writing

about the goals, purposes, and methods of instruction in history.

The Historian's Enterprise

Method

Krug (1967) breaks the historian's method into three stages: research, analysis and interpretation, and presentation. In the research stage, the historian engages in data collection, using primary and secondary sources; analysis; and tests for authenticity and credibility. In the second stage, the historian searches for inner logic, tests data, compares data with other materials, and develops hypotheses and generalizations. Finally, in the third stage, the historian presents the findings in a coherent, meaningful fashion. It is the product of the presentation stage that wins the focus of much of the attention of those who read and study history, while the processes of research and analysis are seldom examined by readers and students of history.

Berr and Febvre (1937) refer to this last stage of presentation as synthesis, suggesting three possible forms. The first, or elementary, form is erudition--an easy, encyclopedia entry presentation of facts. The second, narration, is a reconstitution of details that does not aim to explain but selects facts for lively story presentation. The third form of synthesis is philosophy; in this form, the historian looks for repetition of facts in order to develop laws that underlie the sweep of history.

Most popular among these three forms of synthesis, and the one with the longest tradition, is narration. In fact, the roots of history can be traced to the oral narratives of ancient Greece, created and performed by rhapsodes who stitched pieces of cultural tales into songs. Krug (1967) and many others trace the origins of history to an early written piece, the fifth century book entitled The History of Herodotus. The word "history" originates from a Greek word meaning "to inquire." Herodotus travelled throughout Greece, inquiring about people and events, and weaving his information into a narrative of fact and fable.

History eventually took on the meaning it acquired in other languages: "histoire" came to mean "story" in French and other European languages. Thus, history became known throughout Europe as a narrative reconstruction of the past (Krug, 1967), with an emphasis on the story. In fact, history was often viewed as a part of literature and the humanities, and style and rhetoric were key dimensions scrutinized. Dray, as recently as 1969, has said that historical inquiry is, in fact, essentially a process of constructing stories.

Causation

Historical inquiry, of course, is much more than merely

constructing stories. It involves many complex tasks and issues. Chief among these concerns is causation. Even before history developed into an academic discipline and an organized profession in nineteenth century America (The American Historical Association was organized in 1884), historians have sought to weave a sense of causal relationships that define the evolution of events. An historian might ask, for example, causation questions such as these: What factors caused the fall of the Roman Empire? Why did American foreign policy at the turn of the century evolve from one driven by imperialism to one driven by isolationism? How did the American people come to so distrust the United States government under the presidency of Richard Nixon?

According to Berr and Fervre (1937), an historian weaves a sense of causality from three categories of elements: contingency, necessity, and logic. The category of contingency includes events and changes relative to an individual person, group, place or time. Necessity includes institutional facts, things dealing with societal organization; sociology plays a large part in this dimension of inquiry. Finally, logic includes "deeply rooted tendencies and ideas" (Berr & Febvre, 1937).

Conkin (1977) carves the pie differently, arguing that three kinds of causes direct historical change: willful agents, discrete events, and the whole configuration of a society at a point in past time. And Gardiner (1973) chunks kinds of causation according to two basic kinds of theory: substantive and analytical. Substantive theories are concerned with determining the actual forces operative in history and with trying to elicit the factors ultimately responsible for historical development and change. The causal agencies regarded as determining the sequence of occurrences are conceived to be factors lying outside the historical process. History is thus the unfolding of some overall purpose or design. The analytical approach argues that the fundamental agents of change in historical development are unique to the discipline of history, factors rooted in specific periods and social milieus. Collingwood (1946), in fact, argues that the primary cause of an historical event is the thoughts of an individual agent of change. The historian's goal, then, is not merely to understand the causes of change for particular events but, according to Collingwood (1946), to reconstruct or reenact the process of thinking which caused the change.

A Scientific Approach to History

In the early part of the twentieth century, historical thinkers began to argue that the process of historical inquiry lacked a rigorous methodology. The imagination played too freely on insufficiently established facts (Berr & Febvre, 1937). Besides, science had seen such great achievements; perhaps the scientific method could effectively suit the historian's enterprise. After all, Auguste Comte had earlier argued that

history is essentially no different from other forms of human knowledge. The logical end for all human knowledge, according to Comte, was positivism, a belief that universal laws that can be deduced from direct observation or experimentation govern both the natural and the social universes. While social "sciences" had not yet reached such a stage of development, historians, according to Comte and John Stuart Mill, should study past events in the same way scientists study nature.

The scientific approach to history would feature a pursuit of the facts of reality free of interpretation (Mandelbaum, 1938). The historian's job was to "discover" and examine the fragments of past events and to fit them together into their natural pattern. After all, according to this scientific approach, the facts tell their own story (Hamerow, 1987). Since nature and history were viewed as essentially similar in structure during the early decades of the twentieth century, historians could and should subordinate their individual views to allow the facts to emerge in an objective historical report. What an historian could come to know through such a scientific approach was nothing short of truth:

> History as it is conceived today may blossom into art, may be crowned with philosophy; but it is primarily and necessarily the solid establishment of facts and the precise exposition of the facts established, a task...singularly difficult and delicate; in short, the pursuit and the expression of truth (Berr & Febvre, 1937; 358).

The historian's way of knowing, then, was through the scientific method: the pursuit and expression of truth.

Limitations of Historical Objectivity

The notion of scientific truth dominated the discipline of history until after World War II, but opposition to the hegemony of scientific method in historical inquiry arose as early as the 1930s. Becker (1931) argued that by merely collecting and reporting "facts," and refusing to ask questions, the scientific historian expects a sense of historical order to merely fall into place. But such an ordering is not possible if clear questions are not formulated to drive the inquiry. Berr and Febvre (1937) referred to this distinction as blind curiosity versus directed curiosity. But Becker went further to point out that print has led readers to falsely believe in historical truth:

> The history written by historians...is...a convenient blend of truth and fancy, of what we commonly distinguish as "fact" and "interpretation." In primitive times, when tradition is orally transmitted, bards and story-tellers frankly embroider or improvise the facts to heighten the dramatic impact of the story. With the use of written records, history, gradually differentiated from fiction, is understood as the story of events that actually occurred;

> and with the increase and refinement of knowledge the historian recognizes that his first duty is to be sure of his facts, let their meaning be what it may. Nevertheless, in every age history is taken to be a story of actual events from which a significant meaning may be derived; and in every age the illusion is that the present version is valid because the related facts are true, whereas former versions are invalid because based upon inaccurate or inadequate facts (1931, p. 232).

Since we have no way of ever really determining whether some historian's account of some past event is an actual or faithful portrayal of it, Beard (1935, 1959) argued that no claims can be made on behalf of history as a form of knowledge. History can merely serve as something to nourish the spirit. Goldstein (1976) argues that Beard panicked, losing all hope for history as "a way of warranting claims to knowledge" (p. 34).

In response to Beard, White (1959) argued that historians need to distinguish two kinds of language: a chronicle or almanac (facts, dates, occurrences); and "the profound historical synthesis, the product of history as thought" (p. 199). But Goldstein (1976) challenges such a distinction entirely, reminding us of Collingwood's 1946 claim that the historical past is not the real past. In fact, the real past can never be known.

The scientific approach has proved problematic when applied to history for various reasons. After all, historical "truth" is the truth according to a particular author of a particular age (Eisenstadt, 1966). The time in which the the historical inquiry and writing happen shapes what is known about the events. The interpretive "prism" through which the history is written is not only affected by the historian, but shaped by social, environmental, cultural, and historical factors (Carr, 1961). Furthermore, historical truth is shaped by the value system of the individual historian (Gawronski, 1975), as well as by the value system, or accepted norms, of the historical community at the time of the writing (Carr, 1961).

Still other factors make the notion of scientific truth in history problematic. Gawronski (1975) argues that "Truth can change in history. What is accepted as true at one time may be superseded by the discovery of new evidence, reinterpretation, or the presence of a different milieu at another time (p. 16)." Besides, subjectivity shapes all perception and stories; historians use what they want to tell the accounts they want to tell, and discard the details that do not advance their interpretations. White (1974) argues that historical truth is not only problematic because of the historian's political stance, worldview, and time and place, but also because of the historian's language. The writing of history, according to White, is an act of will. No fundamental truths are available in the history itself. There are no vast superhuman historical forces at work that can be described as understood through the writing of history. Essential to the shaping of what readers

find when they meet historical writings is the rhetoric of the historical work, the language used by the historian to shape the "truth" made available to the reader.

Other writers have criticized the scientific approach to history on the grounds that the social and natural worlds are distinct, and that the past cannot be observed and therefore known as the natural world perhaps can. Berlin (1960-61) argues that historical inquiry is not laboratory research, with data and observation. It requires sharp human intelligence and the common sense that comes of understanding human interactions--to draw parallels and inferences. According to Berlin, the process of verifying facts by means of observation and inference is essential, but more important to the historian is creative intelligence, the ability to analyze human nature and action. From World War II on, the scientific principles of close observation and careful treatment of data were still valued, but historians now recognized that what they could come to know was an approximation, not a certainty. Hamerow (1987) suggests that what remained was perhaps "a science in technique but an art in interpretation, objective in analysis, subjective in perception, logical or systematic in structure, but intuitive or imaginative in outlook (p. 226)."

This move in history away from a belief in objective truth reflects a move in most disciplines. By the mid-twentieth century, many thinkers had advanced the notion that no seeing, observing, or knowing is truly "objective" or free of theory. All seeing is a theory-laden undertaking (Hanson, 1961), and there is no such thing as non-theoretical knowledge (Harris, 1973). Thus, whether they acknowledge it or not, historians and other researchers do not work in some objective, atheoretical manner. Social science, as any of the sciences, is normative, proceeding according to the norms or accepted rules of a group of adherents; seeing is through a paradigm, through a set of beliefs about the nature of reality, a world-view, and thus the "truth" a scientist or historian discovers is shaped by the view of the world to which the writer subscribes (Kuhn, 1970).

What an historian finds, then, depends upon the paradigm or theoretical lens through which he or she views the world. The historian's responsibility is thus to acknowledge the paradigm that drives the inquiry and informs the choices of which parts of society to investigate, which parts to ignore, how to proceed with the inquiry, and how to present the synthesis. The historian must make clear the lens through which the history is shaped--in short, to articulate the theory that drives the inquiry. Assumptions are in place prior to and during the investigation; these assumptions need to be spelled out.

This shift of focus from the products of study to the process of investigation parallels similar shifts in other disciplines. Suleiman (1980) suggests that nearly every discipline within the social sciences and humanities has evolved to a stage of self-reflexiveness, of "questioning and making

explicit the assumptions that ground the methods of the discipline (p. 4)." Even in science, the discipline emulated by historians, objective truth has been challenged and interpretation has been acknowledged as central to scientific "findings." Bleich (1978), in arguing for a subjective paradigm for all knowledge, states quite simply that "knowledge in general comes through synthesized interpretations (p. 33)."

The New History

As a result of various forces, the field of history reached a stage of crisis in the 1960s and beyond (Hamerow, 1987). First, the many problems in adopting the scientific approach had not been sufficiently addressed. An alternative paradigm within the field of history had not taken hold. Second, history was no longer viewed as essential for solving society's ills. And third, the world was now changing so quickly, in such complex ways, that people lost faith in the historical process and discipline (Hamerow, 1987). How can a study of past events really help us to understand the new and pressing world issues such as environmental decay and nuclear armament?

The social sciences, which had sprouted all sorts of new subdivisions, were now viewed as potentially more powerful in addressing social issues. Thus, historians borrowed from social scientists and expanded both their subjects of analysis and their methods of inquiry. The result has been termed The New History by many writers in the field.

The subjects of history were no longer merely the ruling class, but the masses of societies. Events were no longer the focus; social trends earned their place in the historical enterprise. Thus, historical work was performed on such topics as birth, marriage, and death rates; the growing, gathering, and consumption of food; and patterns of civil rights and voting. And essential to the New History enterprise was an emphasis on underlying forces more than events. What historians need to explore and what readers of history need to understand are issues relevant to today. In fact, if history was viewed as lacking in social purpose, it was doomed. History as record of the past was no longer greatly valued. The historian's ability to use knowledge to shape the future was crucial.

If the discipline of history had developed a kind of canon of historical topics which primarily included reports of wars and kings and major events, it now expanded its canon under the New History. Women and blacks finally won some place in historical writings (Gawronski, 1975). In fact, Hamerow (1987) suggests that "yesterday's antiheroes became the heroes of today: blacks, Indians, Orientals, women, immigrants, city residents, slum dwellers, sweatshop workers, labor organizers, and political radicals (p. 165)."

Just as the content of history changed, so did the methodology. Where earlier historians had used documents

(speeches, letters, newspapers) to write an "objective" narrative to recreate the past, historians might now explore methods that fell into what Hamerow (1987) has defined as three groups. The first of these is quantification (cliometrics), the analysis of large bodies of numerical data that chart trends. The second method is social science history, incorporating especially sociology and anthropology. With this method, historians could examine how classes and communities respond to change. The third method is psychohistory, the examination of the intimate psychological lives of individuals.

Problems arose with these new methods, however. Historical quantification too often focused on numbers, to the neglect of interpretation. And such statistical reports often alienated readers even further than previous work that seemed irrelevant in content but accessible in presentational style. The social science histories often used data bases too small for the questions they explored. And psychohistorians, dealing generally with psychological "subjects" not present to answer questions about motivation, too seldom developed the creativity required for their kind of work (Hamerow, 1987).

A Critical Philosophy of History

While The New History expanded the topics for historical analysis, as well as historical methodologies, little attention within The New History writings had been paid to the earlier concern that historians need to acknowledge the forces that shape their inquiries and guide what they come to know. An explanation ought to spell out the steps of the process of historical inquiry in detail (Mandelbaum, 1977). The discipline of history needs to move from "<u>whether</u> historians explain...to clarify in some degree <u>how</u> it is that historians successfully inquire (Ward, 1978, p. 487)."

While philosophers of history in the earlier parts of the twentieth century focused their attention on the articulation of fundamental laws that govern historical development and change, a recent "critical" philosophy of history (Gardiner, 1968) has developed to address questions about the actual enterprise of the historian. Writers in this field of philosophy pose questions such as these: What is historical inquiry? What is its purpose? How do historians describe and classify their material? How do they arrive at and substantiate explanations and hypotheses? What are their assumptions and principles? (Gardiner, 1968).

Goldstein (1976) suggests that while the earlier, speculative branch of philosophy of history that pursued fundamental historical laws was a branch of metaphysics, this critical philosophy of history is a branch of epistemology, an area of inquiry into the nature of historical learning and knowing. This shift in focus moves attention from <u>what</u> historians seek to know, to <u>how</u> historians seek to know, how historians <u>do</u> history. For philosophers, this means careful

reflection on and analysis of the process of historical inquiry and the nature of historical knowing. For practicing historians, this means articulation of all steps of the historical enterprise, with clear attention paid to the historian's process of coming to know.

Bestor (1962) finds importance in examining the process of historical reasoning, since history is, in fact, a way of thinking: "History is not a collection of facts, it is a way of thinking. It is not even a way of thinking about facts, it is a way of thinking about evidence (p. 5)." Historical reasoning operates at four levels, according to Bestor (1962). At the first level, the historian considers many sources and draws inferences from each. The inferences achieve cumulative support and a picture emerges. Finally, the historian constructs a narrative or analysis of the endpoints thus far established.

At the second level of reasoning, the historian draws generalizations from individuals about people of a time and place: groups and parties and nations, a sense of what people collectively have done. At the third level, the historian parts company with other social scientists, in building toward knowledge of the relationship between the past and present. Here, causation plays a central role. Finally, some historians use their work to generalize about historical laws. Since history is the study of human behavior, many historians are reluctant to use the past to predict the future. Still, some historians take historical reasoning through all four of these levels.

Bestor is just one of many writers examining the process of historical reasoning. Such an avenue of thought moves the work of the historian to a level deeper than merely an examination of current topics and forms of history. For The New History is not the first new history. Others have developed in earlier times. But the way history can remain a viable discipline is through its self-reflexive inquiry, through the careful examination of how historians generate knowledge and what purposes history can serve.

The Teaching of History

Problems in The Traditional Approach

History has traditionally held a solid place in the curriculum of public schools, at least in part for its patriotic, cultural, and moral influences. It was long viewed as a body of knowledge that would help make students aware of their national heritage (Burston, 1972). Also, history could aid the moral education of the young, by producing "a future citizen who had the right kind of knowledge and attitudes (p. 224)." Furthermore, the school subject of history could transmit to the next generation the collective memory of humankind. Such a "memory" was typically composed of a body of particulars to be learned by students.

But just as historians found a crisis in their enterprise in the 1960s, so did teachers of history in the 1960s find themselves attempting to teach an unpopular course viewed as irrelevant to contemporary issues and to concerns of adolescents.

The problem of an overemphasis on content and facts in the teaching of history is addressed by a number of writers. In 1967, Krug wrote "....While history is, of course, not 'facts' and 'dates,' the history taught in many schools is exactly that...." Summarizing two National Science Foundation studies, Shaver et al. (1979) report findings of a national survey of administrators and teachers, and findings of a survey of social science research, that too much emphasis is placed upon the teaching of content (historical facts and trivia) and too little upon teaching methods of historical inquiry. Most teachers, the authors contend, are ill-equipped to teach inquiry methods because they were never exposed to them in their own education.

Shaver et al. further report that textbooks dominate teaching and the curriculum in the teaching of history. Very little, if any, reading of other texts by professional historians is required. Teachers base what they transmit to students upon what is found in the textbook. Students demonstrate their "knowledge" by reproducing both the content and language of the textbook.

Just as the historians faced a cry for relevance, so did the history teachers find students demanding relevance in history classes. Youth had little sense of historical perspective to face the social problems of the 1960s (racial tension, the Vietnam War, urban poverty), and the youth found little of such perspective in the curriculum (Thomas, 1970). Students, in fact, rebelled against "the rote memorization of facts and meaningless generalizations, dry textbook presentations, and the inability to conceptualize historical situations. For many students, history was irrelevant (Thomas, 1970, p. 280)." In an era of information explosion, what students needed, according to Thomas (1970), was not exposure to new material but "skills with which to handle data (p. 281)."

The New History in Education

In response to Sputnik and the sense of urgency for educational reform in America, some curriculum developers argued for The New History, following the lead of New Math and New Physics. Three clusters of objectives ran through the work of these curriculum reformers: acquisition of knowledge; use of the mode of inquiry; and attainment of certain attitudes and values (Thomas, 1970; Fenton, 1967). The key changes ultimately fell into three arenas: an expanded curriculum; heightened student engagement; and historical inquiry.

An Expanded Historical Canon

To address the need to broaden the subjects of history, texts for students and teachers no longer restricted the content of history to traditionally white male oriented views of historical progress. Newer concerns arose, such as Black history (Hoover, 1970) and the history of prejudice (Hannam, 1970). Some books explored new emphases, such as economic history, population trends, family and household, and local history.

In a particularly incisive treatment of changes in history textbooks from the 1950s to the 1970s, FitzGerald (1979) describes how many traditional historical heroes took backseat to new emphases. Columbus, for example, was no longer the discoverer of America, but "a walk-on in the middle of American history (p. 8)." General Custer was treated only briefly, but Crazy Horse was now a central figure. George Washington Carver was no longer the sole Black figure worthy of historical treatment; summaries of the contributions of Frederick Douglass, Martin Luther King, Jr., and W. E. B. DuBois filled the pages, too. And despite the lack of any realistic portrayals of the downtrodden (the faces in the textbook pictures were now multi-ethnic but all still smiling and content) the result, according to FitzGerald, was a revised "tone of voice, a definition of the register" of American history (1979, p. 19), a register that included violence and divisions by race and culture.

Despite these textbook and curricular changes, little attention was paid to the call for change in the ways students would be asked to think about the content of history. The expanded curriculum made the inmportant contribution of broadening students' perceptions of the characters and movements of the past, but the fundamental approach to the discipline remained unchanged. The facts and stories of history featured a different cast of characters and concerns, but they remained a body of facts to be learned as fixed content.

FitzGerald (1979) points out that some teachers used the revised history textbooks as an opportunity to train students to treat even textbooks critically, but these teachers were rare. Dunfee (1978) cautions teachers about the act of accepting the printed word as fact. She argues that teachers need to instruct students in extra careful examination of textbook treatment of frequently stereotyped racial, ethnic, and cultural groups. Students should be especially attuned to phrases that degrade or misrepresent groups based on racial or sexual stereotyping. Such recommendations begin to address the need for students to deal with historical reports critically.

Relevance

In response to the cry for relevance in the history curriculum, various authors proposed roleplaying as a means of sensitizing students to a realization that history is not some remote body of facts unconnected to human beings and their

struggles and suffering. Such practices became fairly popular, particularly in the 1970s. Shaftel and Shaftel (1982) suggest that students need to explore the feelings of people in history in order to come to care more fully about their stories. They propose roleplaying as an ideal means of creating in students a sense of identification with historical figures. The process of sociodrama serves to present to students a dilemma people faced in a particular period of history (the freeing of slaves, migration to the New World, dropping the atom bomb), with the goal of enacting the drama to personally experience the dilemma. Shaftel and Shaftel describe in detail some model roleplaying exercises for various decision crises in American history. For each crisis, a dilemma is presented: Should President Jefferson buy the Louisiana Territory? Then a sociodrama is provided--a one-page rendering, often in narrative form and often with invented dialogue, designed to crystallize the dilemma. Following this, students are asked to roleplay characters in the situation. The authors recommend that teachers ask such questions as these: What do you decide? How do you present your decision to your opponents? The key purposes are these: a sensitization to the issues of human beings in history, and an improved level of student engagement in the discipline of history.

In the recommendations for roleplaying and sociodrama in the history classroom, the focus for knowing history rested on finding personal relevance for the student, a kind of linking up of the text of history with the student's personal life and experiences. This approach aimed to address the affective dimension of student response. The alternative methods, in other words, emerged for purposes of relevance, empathy, and heightened engagement. These changes were, in a sense, more cosmetic in nature than fundamental in changing the nature of the learning in the discipline. The goal, again, was to know (or to become sensitized to) how people thought, felt, and lived.

Other methods were proposed to heighten student engagement in history, such as the use of projects, audio-visual materials, and music. Again, these proposals were ultimately superficial with regard to affecting long range student learning. Handlin (1979) harshly criticizes this struggle for clientele that caused history to lose sight of its own intellectual validity: "Nor would sleek audiovisuals stir the interest of an audience reared since childhood on TV offerings....The misdirected search for clients obscured the genuine values of the discipline."

The Inquiry Method

Only the inquiry approach within the New History proposals promised to address the need for the history teaching profession to move history beyond a focus on content to a focus on skills for thinking like an historian and for gathering, organizing, and interpreting data. This inquiry or historian approach proceeds on the assumption that students should be taught to think like

professional historians and to practice the historical method. Such an approach usually involves focusing a unit on one or two historical events (for example, the Salem Witch Trials), immersing students in large quantities of relevant primary sources (letters, documents, speeches, artifacts), and then asking students to conduct an historical investigation along the lines of the professional method.

In this inquiry approach, students are asked to strive for historical-mindedness, examining especially their own biases, as well as the biases of the participants in the historical events and of the recorders of information about the events. The students follow various steps. First, they place each document in its social, political, and economic context, scrutinizing it for bias. Second, they focus on the meanings and implications of the text itself. Third, they look for corroboration among witnesses' accounts. And finally, students strive for a reasoned interpretation, recognizing that historical certainty is an impossibility.

Such an approach is advocated and articulated by many authors, including Dickinson and Lee (1978); Lorence (1983); and Ryan (1971), who argues that even elementary school students can and should engage in such an approach. Horsfall (1973) suggests that such an approach moves history away from an emphasis on facts to a focus on data to structure and synthesize. This shift from product to process invites students to confront history first-hand, as far as is possible: "It is only distilled to a minimum extent by the teacher or books (Nicholas, 1972, p. 232)." This way of thinking can serve students in various ways. It introduces students to logic or the pattern of historical explanation; it can help students deal with modern problems; it invites students to immerse themselves in some issues to more fully understand the uniqueness of events; and it helps students gain a sense of historical perspective (Burston, 1972). Fenton (1966) argues that "we must teach methods of interpretation if we claim to teach history. Students must learn the rules by which historians collect evidence, and use it to interpret the past if they are to read and write history intelligently. They must be able to judge whether an author's conclusions are supported by the evidence he presents (p. 150)."

Problems in the Inquiry Approach

The inquiry approach met with lines of resistance, the most popular of which was the claim that history must be taught as indisputable fact or students will grow confused and unsettled. Other problems were suggested. The inquiry approach would be too demanding for the teacher, who must now continually gather sources; the process is slow and limited in breadth for students; and students often need clarification of context for the sources in order to proceed with their investigation (Nicholas, 1972). Furthermore, students tend to deal with primary documents in a passive manner, finding it much easier to move to secondary sources where "the judgments and analyses have been done for

them" (Feldman, 1980). Finally, students do not have sufficient preparation and training in historical thinking (Thompson, 1972).

Dunfee (1978) addresses the issue of lack of training for students by describing model activities that ask students to engage in the inquiry method about current events. She asks students to gather data, draw generalizations, propose hypotheses about future occurences, and provide reasons for hypotheses proposed. Practicing the inquiry approach with contemporary data and questions might help prepare students to engage in the process with events and documents from the past. Dunfee (1978) also addresses the issue of the demands on the teacher by providing some principles and tips for teachers in selection of materials. She argues, for example, that students ought to be involved in the decisions about sources to examine, and in the search for materials.

Comparing the performances of professional historians with those of college students on historical problem solving tasks, Gladwin (1982) found the students performed quite poorly and did not appear to think like historians. He asked two questions about the skilled performances of the historians: What cognitive tasks, processes, and skills are essential to historical problem solving? And what heuristics or rules-of-thumb aid the historian?

Gladwin carved the skills into two categories: search and focus; and reconstruction. In the search stage, the historian would scan and hold: scan all data, sample the information, hold some in mind, and recode some for later use. In the focus stage, the historian would generate lists of questions and lists of sources needed to answer those questions. The questions were "why" questions: Why did trend X happen? In the reconstruction stage, the historian would order, relate and recall, drawing on on prior knowledge to generate hypotheses, often in the form of questions: Could the reason for this event be X?

Gladwin found that a typical student search was shallow and unfocused; relevant dates and facts were ignored; and no questions or hypotheses were generated. He proposes that students must be taught to think more like historians. The key to this instruction lies in the teaching of the heuristics of the historians in Gladwin's study, including such guiding principles as the factoring of the problem into sub-problems, using evidence to suggest some of the divisions; the withholding of final judgment or premature closure; and the crucial process of questioning. Such heuristics, according to Gladwin, will help students to think like historians and to therefore deal more successfully with the inquiry approach.

Recent literature on the teaching of history draws heavily on recent developments in the historian's enterprise. First, the expanded historical canon reflects similar broadening of subjects in the historian's inquiry. Second, the argument that textbooks

should be examined critically by students acknowledges the current paradigm that informs historical inquiry: the recorded past is not "truth," but an interpretation of truth. And most powerful of all, the inquiry approach moves the teaching and learning of history beyond a study of facts to a simulation of historians' ways of knowing and doing.

This third area (the inquiry approach), despite its problems already discussed in this chapter, holds the potential to not only teach students to engage in the process the historian pursues professionally, but to also provide students who live in an information age with skills for handling data. In particular, Gladwin's explication of the historian's heuristics and his recommendation that students need to be taught such skills explicitly hold rich possibility for helping students to learn the historian's ways of knowing for use in history classrooms and in other school and non-school settings.

But this picture of instruction draws primarily on articles of theory into practice and on pedagogical pieces. What is the actual state of history instruction in the late 1980s? Do history classrooms practice some of the provocative proposals of recent pedagogical writers? In 1975, Davies and Pritchard found little evidence that The New History had gained ground in schools. They found that students talked mostly of textbooks, dictated notes, and the learning of facts in their history classes, with little or no mention of exposure to primary sources. They found, in fact, that "School history remains essentially content-based, chronologically arranged, nationally-biased, politically-oriented, formal in learning methods, limited in resources, and deficient in attention to both objectives and their evaluation (Davies & Pritchard, 1975, p. 114)." The Shaver et al. (1979) report on two National Science Foundation studies of history instruction report a similarly grim picture of history classes still dominated by an emphasis on the rote learning of facts.

History teachers whose classes are still dominated by an emphasis on the learning of facts and who do not teach historical reasoning--the ways of knowing of an historian--have failed, first, to draw on some provocative and careful thinking of recent pedagogical writers. But second, they continue to teach in a manner that is theoretically anachronistic, for a syllabus dominated by the teaching of facts runs counter to the thinking of the most respected historians and philosophers of history of recent decades, who have argued in the vein of Becker (1931) that history is a blend of truth and fancy. Historical fact is not even a possibility, for we can never know the real past with certainty. Thus, the rote memorization of historical "facts" becomes a fairly meaningless practice.

The history teacher, however, who teaches history as a way of thinking provides students with a special opportunity. Bestor (1962) argues that history is precisely such a way of thinking:

> This is not because the facts it presents are of transcendent importance. Taken one by one they are not. It is not because the conclusions history reaches are of impressive certitude. They cannot be. History deserves a central position in every sound program of liberal education because of the means it provides for disentangling and comprehending the problems of human nature (p. 9).

History may provide such a means for disentangling and comprehending, but only when historical thinking rests at the heart of instruction.

Summary

Thus we can see that the field of history, like that of biology, has been undergoing a large-scale shift in the ways of conceptualizing both knowledge and ways of thinking, at theoretical and pedagogical levels. While these have resulted in some changes in the actual curriculum -- in a broadening of the actual material that students study -- these changes have not been accompanied by concomitant changes in instructional goals. The focus remains on the acquisition of content and not on ways of thinking "like an historian" about historical issues.

Some of the same concerns have dominated theoretical and pedagogical discussions of literature. These will be discussed in the next chapter.

Chapter 5

Theory and Pedagogy in Literature

Elise Ann Earthman
Steven Athanases

Our review of works in literary theory indicates that changes in the field have paralleled those in biology and history with a move away from established 'truths.' However, the proposed alternatives have been varied, and theoretical debates continue. While the notion that texts themselves do not contain a univeral meaning has been widely embraced in the pedagogical literature, the various theoretical alternatives have not. First we will review the theoretical debates, and then review the pedagogical concerns.

Literary Theory

Literary theory in this century has seen periods of revolution and counterrevolution, and its practitioners approach the twenty-first century divided into factions and camps whose attitudes toward one another range from bemused tolerance to open scorn. These rival groups are divided not just by their methodologies or approaches to literature, but often by deeply held philosophical and epistemological beliefs regarding the nature of reality and our ways of knowing it.

In a recent article, de Beaugrande (1984) offers a perspective from which to view this multiplicity of literary theories, a framework with which to organize our thinking about it. Taking a discourse-processing approach, de Beaugrande points out that various groups of theorists will view the same text differently because they "differ in the points where they impose a processing threshold when they consider the text to be adequately accounted for" (p. 534). Critical theorists will approach a text with "a predisposition for making certain uses of certain classes of [literary or artistic] evidence" (p. 538); rifts between theories have occurred because of "wide disagreement . . . about what counts as evidence, what predispositions should be followed, and what conclusions should be drawn" (p. 538). In various literary theories, valid evidence may be drawn from the text, from the reader's interaction with the text, from the author's life, from the reader's life, and so on. The conclusions drawn may focus on the text alone, on the reader's psyche, on some combination of the two, or on a combination of the two plus their relationship with the world. We may consider the act of interpretation a totally objective one, totally subjective, or somewhere in between. When we look at the

various critical movements and perspectives, it is helpful to remember that each critical theory will offer a particular way of knowing literature, and will argue its case convincingly, for as de Beaugrande has pointed out, "a theory is both a description and an advocacy of a way to make use of evidence" (p. 539).

Early in the 1900's, literary studies remained rooted in the long-established tradition of identifying the historical antecedents of a work and explicating its author's biography. Discussions of a work itself often focused on the individual critic's "impressions" of it and on evaluation of the work's worth. The larger purpose for reading literature, especially for working class children exposed to its benefits in school, was the promotion of cultural values and the elevation of taste in those who read those works deemed worthwhile. But the 1920's saw the beginning of a revolution in literary theory, one which had its inception in England with F.R. Leavis and Q.D. Leavis' desire to make literary analysis more rigorous, with I.A. Richards' attempts to formulate a "scientific" system of literary criticism, and in the poetry and criticism of T.S. Eliot; this movement found its fullest expression in the work of those labeled the "New Critics" in the U.S.--Cleanth Brooks, Robert Penn Warren, John Crowe Ransom, Allan Tate, W.K. Wimsatt, Monroe Beardsley, and others.

The New Critics, in their period of greatest influence from the 1940s through the 1960s, shifted the attention in literary study from a work's author or its historical context to the work itself. Instrumental in articulating this point of view was an article written by Wimsatt and Beardsley, "The Intentional Fallacy" (1946), in which they held that an author's intention is irrelevant except as it adds to our understanding of the overall structure of the work. In fact, Brooks and Warren (1943) pointed out that we understand an author's intention by understanding the poem, not the other way around. In another important article, "The Affective Fallacy" (1949), Wimsatt and Beardsley disposed of the notion that a reader's emotional response to a work is a useful part of critical response; they insisted that a poem and its results should not be confused.

A New Critic's function is not to paraphrase a poem or extract "meaning" from it (which Eliot referred to as the "lemon-squeezer school of criticism" [1957, p. 125]), but to make "the fullest realization of the symbolic structure that <u>is</u> the poem" (Brooks, 1947, p. 266). The critic will do this through close reading that seeks the poem's essential unity, its balance as expressed through its elements--ambiguity, symbol, wit, paradox, complex perspectives, and irony, among others. The poem is an object available for objective analysis, and the New Criticism developed the tools for such rigorous analysis. New Criticism eliminated the dualism between content and form; believing that a poem is an organism, a self-contained object, Brooks comments that a poem's form is not "a kind of box, neat or capacious, chastely engraved or gaudily decorated, into which the valuable

and essentially 'poetic' content of the poem is packed" (1947, p. 223). Form for the New Critic is meaning, and the New Critic's function therefore is to elucidate how rather than what a poem means.

The influence of the New Criticism on literary study and pedagogy (discussed below) has been profound and far-reaching; though no longer viable as a critical school, it still receives much attention and served as the focus of literary criticism's counterrevolution of the past few decades. Cain (1984) argues that New Criticism still is criticism and is the touchstone for all other critical methods, which tend to define themselves in relation to it.

At present, literary theory is characterized by its diversity. A recent year's bibliographical index of articles on literary criticism lists no less than 24 different "approaches" to literature; for many of these categories, specific instances of literary criticism representing a particular approach are too numerous to list in the index itself and may be accessed only by computer. Journals publishing literary criticism abound, and several schools of criticism have journals dedicated to their particular focus, for example, Genre, Journal of Narrative Technique, or New Literary History. However, out of this diverse group, several schools of criticism have emerged as being extremely influential.

Northrop Frye occupies a unique position within literary theory, one which is not easily categorized. In his desire to foster a "scientific attitude" within criticism (1957), in his view that "criticism is a disinterested response . . . in which all one's beliefs, engagements, commitments, prejudices, stampedings of pity and terror, are ordered to be quiet" (1963, p. 140), and in his view that author's intention is irrelevant, he recalls the New Critical position, later taken up by structuralists (discussed below). And yet he differs from the New Critics in his desire to elucidate the structure of literature as a whole, to develop a comprehensive system for categorizing literary works, and to place each individual work within it. Though his system is content-oriented, based on archetypes and motifs within genres, it resembles the formal linguistic system of structuralists in that it allows the critic to find significance not only in the individual work but also in its position in a larger structure.

Phenomenologists such as David Halliburton, Sandra Gilbert, and E.D. Hirsch, following the ideas of the German philosopher Edmund Husserl, see a literary work as representing a certain reality that had been contained in the mind of the author. While excluding biographical facts from the analysis, phenomenologists try to identify passively with a work in order to reconstruct the author's consciousness as expressed within it. Phenomenologists do not make value judgments; leaving their own world behind, they attempt to enter the world of the work on its own terms and to experience objectively, neutrally, what the author intended to

convey. Such an analysis is a "passive reception of the text, a pure transcription of its mental essences" (Eagleton, 1983, p. 59), is neither subjective nor objective, and is wholly text-based; whatever meaning there is to be derived from the work resides strictly in the text, in its preservation of the author's intention. This position contrasts with that of reception theory (or reception aesthetics), a branch of hermaneutics, as expressed in the work of Wolfgang Iser (1978). Iser has focused on the role of the reader in understanding a literary work; he sees reading as a dynamic process in which readers will bring to a text their own beliefs and experiences, will have certain expectations of the work that are fulfilled or not fulfilled, and will work to construct a consistent realization of the text and its meaning. Though to Iser the role the reader plays is a crucial one, his theory remains grounded in the text, which functions as a blueprint for the reader's understanding.

Resembling Iser (although arguing with him and among themselves), another theoretical group has emerged that may be loosely united under the label "reader-response critics," including Rosenblatt (1978), Fish (1980), Bleich (1978), and Holland (1968, 1975). These critics view the text as progressively less controlling of the process of meaning construction and interpretation; while Iser and Rosenblatt hold that the text functions as a blueprint, guiding the reader's encounter with it, Bleich and Holland see it more as a springboard to the reader's understanding, which springs more from the reader's own psyche. Since meaning will be a product of the reader's interaction or transaction with the text, it will undoubtedly vary from individual to individual. Authority for interpretation thus lies within the reader or, for Fish, within "intepretive communities" which guide and then validate the individual's understanding.

Structuralists take yet another approach to literary works. Growing out of the work of the structural linguist Ferdinand de Saussure, literary structuralism holds that humans do not shape language to their needs, rather language shapes us and how we view reality. At the same time, language is a system of signs that is arbitrary, conventional, and relational, and a literary work is therefore a self-contained system that needs no connection to outside "reality," either to the objective world or to the world of human emotion. Structuralists make sense of a literary work by concentrating on the form, rather than the content, by drawing out the relational meanings of the elements, by identifying oppositions, inversions, and parallels within the work, by determining how an individual work's "deep structure" is an instance of a particular system of rules or signs. Modern theorists of structuralism have included Culler (1975), Scholes (1985), and Hawkes (1977).

Following the structuralist counterrevolution against the New Critics came a challenge to the structuralists themselves; post-structuralism and deconstruction reject the notion that the individual text is an instance of rule-bound language. Post-

structuralists such as Derrida (1976) or Miller (1982) see the text as a dynamic process and its signs as unstable rather than stable or fixed entities. Meaning in the work is unfocused, becoming disseminated by chains of associations in the reader's mind. Through deconstruction we question the presuppositions of language and focus on its ambiguity and indeterminacy. Texts thus subvert themselves, they "forever undo the propositions that they make" (Fischer, 1985, p. 53), so criticism becomes as much an act of creation as was the writing of the original work. Post-structuralists reject the idea of authority, believing that readings of a text are never "finished" and that a text will inevitably be deconstructed differently by different interpreters, or even by the same interpreter at different times.

Another group of critics uses Freud's theories to analyze literary works. Psychoanalytic critics, who include Wright (1984), Bloom (1976), Holland (1975, also discussed above under reader-response critics), and Felman (1982), may focus on one of several areas. They may use the work as a mirror on the psyche of the author; what has been revealed in the work about the author's fears, repressions or neuroses? The psychoanalytic critic may apply the same methods to the work's contents, psychoanalyzing a character or characters within the work or noting the significance of its symbols, or to its form, to how a text works in addition to what it says. Or the critic may focus on the reader, using the reader's encounter with the work to determine the reader's "identity themes" (Holland, 1975), how his own unconscious responses to a text totally shape his interpretation of it.

Sociological critics turn from the inner world to the outer, to literature's discourse with society in its various guises, adding a third element to the interaction: reader-text-world. Their perspective may be historical (Said, 1983; Weimann, 1984), Marxist (Eagleton, 1976; Williams, 1977; Bakhtin, 1981), or feminist (Donovan, 1975; Showalter, 1977; Evans, 1984). Their concern is with how a text represents an era or an ideology and, often, with <u>exposing</u> the work's particular ideology so that it is available for critical response. Sociological critics, particularly those of the Marxist or feminist perspective, believe that as the world and its values have shaped literature, so can criticism help to reshape the world; by revealing a work's ideological underpinnings for what they are, critics may then invite readers to rethink their attitudes toward the work and the world it represents, and in the end it may have a salutary effect.

Eagleton has stated that "becoming certificated by the state as proficient in literary studies is a matter of being able to talk and write in certain ways . . . literary theorists, critics, and teachers, then, are not so much purveyors of doctrine as custodians of a discourse" (1983, p. 201). But what are these ways, what characterizes the discourse? Contemporary literary theory is distinguished by nothing so much as its plurality; we may be objective or subjective in our readings, we may locate

meaning in the text, in the reader-text interaction, in the reader, in the text's relationship with the world. We have a variety of tools at our disposal: we may search for the traditional "elements of literature," or apply linguistic or psychoanalytic methods, or identify the structure of a text or deconstruct it. Although the mid-twentieth century, during the reign of the New Criticism, saw a relatively peaceful period of unified perspective in literary criticism, in the latter twentieth cenury the revolutionists and counterrevolutionists wage war on one another. Bleich (1976) believes that the changes in literary theory parallel a powerful intellectual shift taking place in many disciplines from an objective to a subjective paradigm; this accounts for some varieties of literary theory but certainly not all. Though literary studies may again find a common focus, such a unification seems unlikely in the near future.

Literature Teaching in College

Literature study at the university level between the 1880s and the mid-twentieth century focused, according to Bate (1982), on five areas: 1) historical periods of literature; 2) author biography; 3) the text, with the intention of establishing what was the most authoritative version of a work with respect to punctuation and exact wording; 4) sources of a work, establishing referents for its allusions and origins of its themes; and 5) philology, the study of the history of words. Attention to these areas quickly waned when the New Critics argued convincingly that the only object worthy of attention was the poem itself, and during the expansion period of the 1950's and 1960's, English majors were almost exclusively trained in methods of close analysis, often focusing on a small number of complex works by modern authors. This had the effect of narrowing the focus of literary study (Cain, 1984), and fragmenting it as individual professors grew ever more specialized (Bate, 1982).

When the economic recession of the 1970's resulted in declining numbers of students, college English departments responded by offering new types of literature with, for example, a particular ethnic or gender focus. In the intervening years, the new theoretical focus of structural criticism has brought new interest in establishing an intellectual core for literary study (Bate, 1982). But William Cain (1984), at least, holds that the back-to-basics movement of the 1980s has affected college pedagogy as much as it has the lower schools, and has resulted in a reemphasis on close reading of an approved canon of works. Numerous writers (e.g. Bate, 1982; Cain, 1984; Ohmann, 1976) have commented on the "crisis" in English studies; the cause for such a crisis seems to lie in the lack of a central focus in either theory or pedagogy. As a result, numerous models for the teaching of literature at the university level are currently used, and each model seems to be based on what its adherents see as the purpose for reading and studying literature. In addition,

each model brings with it its own perspective on some of the issues currently being debated in the teaching of literature at the college level: what should the canon consist of? How should literary works be analyzed? Where does the authority for meaning lie? What role should the teacher of literature play?

First is the "high culture" model, for which the purpose of studying literature is to come to know "great works." The greatness of such works often inheres in the fact that they deal with "universal" themes, that they possess a certain organicity (the form is as highly realized as the content), that they repay close investigation on a number of levels, that they have stood the test of time. This position, which dates back to the ideas of Matthew Arnold, has recently been espoused by E.D. Hirsch in his much-debated work, Cultural Literacy (1987). Most interesting is that this position is so firmly entrenched that its proponents rarely spend time defending it; as the traditional model, however, it comes much under attack in the literature, especially with respect to expanding the time-honored canon. Thus in College English, the teaching journal for English at the university level, we see articles written by those who speak for segments of the population whose interests have not been represented in the traditional canon and who advocate the inclusion of literature by women (e.g., Cote, 1982; Whelchel, 1984; Aiken, 1986) and by working-class writers (Coles, 1986), and popular fiction (Stowe, 1986). The teacher who adopts this perspective is frequently a transmitter of knowledge found in the text and who regards it, according to Scholes (1985), as secular scripture.

A second camp, which could be labeled "sociological," uses literature as a mirror held up to culture, or to a particular aspect thereof, and uses the teaching of literature as a vehicle for students to learn about the world they inhabit, about the mores, values, and assumptions of our own time and place and those of other times and places; it also emphasizes the social origins and uses of literary texts. The image of society found in a literary work is then available for analysis and criticism. Recent proponents of this position include Thomas (1987), who argues for a "New Historicism" in literature courses; Coles (1986), who suggests a course on working-class literature and its uses; and Cain (1984), who advocates the inclusion of social, political, and historical materials in literature courses.

The third camp holds that through the study of literature, students will come to know themselves and to grow as a result of their contact with it, as literature is used as a mirror held up to the individual psyche. Theorists such as Bleich (1975, 1978) and Holland (1968, 1975) advocate reading texts with the specific intention of gaining personal knowledge: What do this text and my reactions to it tell me of myself, of feelings, wishes, and desires that previously may have been unknown to me? Holland's work brings a particularly psychoanalytic focus into the classroom, and the teacher occupies a particularly analytic position that has recently been criticized by Rouse (1983) as

being inappropriate. Other writers have pointed out how literature may be used to alter attitudes or change a reader's outlook; for example, recent articles have suggested using literature to teach peace values (O'Reilley, 1984), or to increase the sensitivity of health care professionals to their patients (Spatz, 1982).

Another group emphasizes the linguistic and cognitive benefits of studying literature, focusing on the more practical benefits of literary study. Frye (1964) spoke of the value of literature for teaching us to recognize, understand, and be critical of the various uses--and abuses--of language in the everyday world, a theme that has been picked up by Widdowson (1975) and, most recently, by Scholes (1985) in his book Textual Power. Knowing literature can help us see through political rhetoric, advertising copy, and other manipulative forms of writing that surround us. Through literary study we may also, according to Scholes, acquire some of the power and grace of language for ourselves, "the power to select (and therefore to suppress), the power to shape and present certain aspects of human experience" (p. 20). Additionally, the study of literature can have cognitive benefits; Gopen (1984) sees the study of poetry as being the best preparation for the rigorous intellectual challenge of law school, Dilworth (1985) advocates literary study as a way to develop critical thinking abilities, and Bergstrom (1983) has argued that through literature students may develop the level of thought characteristic of Piaget's formal operational stage.

A final camp finds a purpose for the study of literature in the student's coming to know the process of making meaning itself. Literary theorists Rosenblatt (1978), Iser (1978), and Fish (1980) take the relationship between the self and the text as central; the "poem" itself is created from this interaction and does not exist outside it. A work will be individually constituted from the author's blueprint and the individual's prior knowledge, experience of literature, and assumptions held as a member of an interpretive community (Fish, 1980). A number of articles coming out of this perspective have been published in recent years. Hunt (1982) advocates a "process-intervention" model of literature teaching, in which students are taught "to attend to and intervene in [their] process . . . to help them get control over their reading and to make them better readers rather than merely better producers of interpretations" (p. 348). Petrosky (1982), using a heuristic derived from Bleich (1978), helps students to engage in the kind of "reading that teaches us how to think" (p. 21) and to represent their process of comprehension in writing. Salvatori (1983) argues that the study of literature, and in particular literature used as a way of "reflecting on the strategies by which readers--all readers--generate meanings in the act of reading" (p. 659), will help students develop "reflective habits of mind" (p. 659) that will allow them to become better writers. McCormick (1985) approaches the reader-text interaction from yet another perspective, using response statements to explore issues raised

by cultural, historical, phenomenological, and structural approaches to literature with the goal of making students "stronger, more informed and self-conscious readers of literature" (p. 837).

If reader-response theory appears in the pedagogical literature more than any other form of literary theory, it may be because it holds the most potential for teaching students a way of thinking about literature that begins in the personal and affective dimensions, which theorists (e.g., Bleich, 1975; Iser, 1978; Rosenblatt, 1978) argue is the foundation for a later analytic or critical response. Thus Petrosky (1982) asks students to write 1) what they perceive in the text; 2) how they feel about what they see; and 3) what associations--thoughts and feelings--inform and follow from their perceptions (p. 25). In McCormick's (1985) framework, these questions become 1) what is the predominant effect of the text on you; 2) why do you think the text had that effect; and 3) what does your response tell you about yourself (p. 838). Through such heuristics, students may begin to develop a way of knowing literature that will serve them as they move into more critical and analytic writing. Petrosky notes, "I do think that this kind of elaboration and explanation is a necessary beginning to more critical examinations of texts and the assumptions underlying readers' readings of them" (p. 34), and this seems to be a commonly held belief of those using reader-response methods in the classroom. These articles do not, however, discuss how students are to make such a step; very little, if anything, is said about how a student is to transform personal reactions into transactional writing about literature of the type that is typically required in college classrooms or that is practiced by professionals in the field. Indeed, discussion seems to focus on getting students to <u>think</u> analytically (Petrosky, 1982; Bergstrom, 1983; McCormick, 1985) rather than on helping them to know how to structure their arguments. An exception is Peterson (1982), who specifically discusses writing about literature and argues for personal response forming the base from which students will learn to write expository and critical papers. But although he outlines the movement, from freewriting to research and critical essays, a series of writing assignments would take over a year's time, and although he suggests these papers might have a biographical, sociological, psychological or interpretive focus, he does not address the question of how students are to learn to develop and structure argument in the more formal papers they write.

It is interesting to note that although discussion of the pedagogy of literature exists, it is not the main focus of even that portion of a journal such as <u>College English</u> which is related to literature. An examination of the journal's articles with literature as their subject over the past five years reveals that less than 20% center on the actual teaching of literature, on <u>how</u> to teach; another 18% focus on the canon, or <u>what</u> to teach. Most of the remaining articles represent discussions of critical theories or examples of actual criticism, or focus on more general pedagogical concerns that are frequently theoretical

in nature (e.g., articles on how to bridge the gap between literature and composition studies, on how literary study became a "pure" discipline, or on Marxist theory and its relation to the teaching of English). Outside of those articles mentioned above that make connections between reader-response theory and the teaching of literature, few writers draw connections between literary theory and the pedagogy of literature; interestingly, several articles have recently appeared that make connections between, for example, structuralist/poststructuralist theory or psychoanalytic and feminist criticism and composition classes (Harris, 1987; Donahue and Quandahl, 1987). But with the exception of the piece by McCormick (1985), who introduces students to several different critical approaches to literature, no articles have appeared in College English in the past five years that discuss bringing current literary theories--other than reader-response--into the literature classroom, and McCormick's is the only article that even suggests that various critical approaches exist.

It may be somewhat puzzling to discover so little attention in the pedagogical literature to introducing students to the discipline of literary study as a college subject. But upon consideration, we may see that as an art, literature offers a potential classroom focus that other disciplines such as biology and history may not, for it is possible to read, understand, discuss, and appreciate literature without employing formal critical methods. Indeed, some writers in the current pedagogical literature (e.g., Hunt, 1982) specifically argue against providing students in introductory college classes with the tools for literary study; in Hunt's opinion, students should not concentrate on producing interpretations at all, but should be learning to "experience and value" (p. 347) literature. This differs from other college disciplines in which introductory courses may begin to acquaint students if not with the methodology, at least with the ways of thinking of professionals in the particular area. No one in the college level pedagogical literature suggests bringing examples of literary criticism into the classroom to demonstrate the ways that literary critics think, and those who employ reader-response methods for interacting with a text do not discuss how a student is to move from an initial transaction with a work to the kind of analysis published by reader-response critics such as Fish (1967) and Iser (1975). At the college level, there seems to be a gulf between what literary critics and theorists do and what students are being taught to do.

Literature Teaching in High School

The teaching of literature as a high school subject dates back to the mid-nineteenth century when the subject was literary history and its goal the memorization of facts about authors and

their works; the purpose of such study was for students to master a formal discipline. By the turn of the century, literature teaching had a new justification: Through the study of literature, students would discover "a reservoir of cultural values and a source of moral strength" (Applebee, 1974, p. 22). The methods of literary study were no longer exclusively historical but incorporated those of philology as well, with its close attention to language. The curricular focus in high school was very much shaped by college lists, those texts upon which students applying for admission to various universities would be examined. The early days of the twentieth century saw an increased emphasis upon the values inherent in a work.

The progressive era in education brought a new direction to literary study; its purpose, at least at the high school level, was to allow students to broaden their experience, to engage in vicarious exploration "of self, of society, of the past and present world" (Applebee, 1974, p. 80). Attention was given to content rather than form, and the canon began to broaden to include contemporary authors, although in general the most highly valued texts continued to be those from the traditional canon. Classroom teaching was generally organized by types or genres.

By the 1940's the focus of literature teaching had shifted somewhat; literature was seen as a way for students to come to understand and to solve life's problems. Lists of books were developed that were keyed to helping students handle specific problems in their lives and to prepare them for life as adults. But the radical changes that the dawn of the Space Age in the late 1950's brought affected not only scientific and technical subjects but English teaching as well.

Literature was redefined as an academic subject and literary study took up the methods of the New Critics, in which close reading and analysis of texts, technical vocabulary, and strict objectivity were emphasized, with little attention given to literary history, author's biography, or a reader's individual response to a work. This approach was quickly displaced in the late 1960's by a focus on the social relevance of literature and on student-centered programs in which traditional course sequences were replaced with electives. The late 1970s saw yet another pendulum swing as the "Back-to-Basics" movement took hold, and the curriculum returned to its traditional center on an established canon of texts.

This recent period of change in the teaching of literature has, according to Applebee (1982), "left teachers without a powerful central metaphor to guide their teaching of literature, with the result that eclecticism predominates" (p. 1109). He points out that in general three models for literature teaching exist at the high school level, "one based on cultural heritage, one based on personal growth, and one based on the development of specific competencies" (p. 1109).

If high school teaching suffers from the lack of a central

metaphor, one may be developing; much of the current pedagogical work reflects the perspective of reader-response theory, with its attention to affective engagement and personal response. In fact, two of the central reader-response critics, Louise Rosenblatt and David Bleich, published major pedagogical works before they published longer, fuller articulations of their theories.

While Rosenblatt's (1978) The Reader, the Text, the Poem elaborates her transactional view of the literary work for students of literary theory, her earlier Literature as Exploration, first published in 1938 with later editions in 1968, 1976, and 1983, lays the foundation of her theory as it applies to the teaching of literature. In this work, Rosenblatt explains how the reader's experiences and knowledge shape a reading of a text. The text, merely inkspots on the page, becomes a live literary experience, even a performance, when reader meets text. While author biography, historical background, or a study of a text's formal properties can all serve to enrich a reader's experience of a work, fundamental to literary study must be an initial, personal transaction, where reader meets text.

Like Rosenblatt, Bleich published his major pedagogical work, Readings and Feelings: An Introduction to Subjective Criticism (1975) before his major theoretical work, Subjective Criticism (1978). A slim volume--one-third the length of the later theoretical work--Readings and Feelings includes concrete suggestions for eliciting students' emotional responses to literature. Bleich suggests tapping first the student's affective response, feelings during and after reading the text. Second, the teacher should tap the associative response, the student's attempt to explore personal experiences that have inspired emotions analogous to those elicited by the text in question. Bleich recommends various writing tasks followed by a move to "Interpretation as a Communal Act," a process of exploring issues that cut across various student responses to a work. Replete with anecdotes from his own college teaching and countless samples of student-written responses to literature, Readings and Feelings proves to be a clear curricular guide that culminates in the chapter, "Using This Book: Pragmatic Suggestions and Elaborations."

Bruce Miller's Teaching the Art of Literature (1980) explores literature as event, object, and message, and while Miller writes for teachers with few theoretical references in his prose, he cites Rosenblatt, Holland, and other reader-response critics in his footnotes, and his arguments clearly draw on the notion in recent literary theory that the reader's contribution to the making of meaning is essential. Miller provides examples of different readers making different meanings of text, and argues that the individual reader must first constitute a text before interpreting it. Such an argument supports reader-response claims that texts are notations to be named and interpreted by readers.

Popular in California and likely to influence teacher groups nationally, the California Literature Project has published one major work, Literature for All Students: A Sourcebook for Teachers (1985). Filled with sample lessons and suggested approaches to particular literary workss, the sourcebook provides a model of "into, through, and beyond" the literary work. Again drawing on the emphasis in recent literary theory on the reader's contribution to meaning, the California Literature Institute participants recommend strategies that link texts with student lives, that help students draw on their previous experiences and prior knowledge when they meet new pieces of literature.

A major focus in the literature sections of English methods textbooks seems to be on how to get students engaged in and involved with literature. Mersand (1977) argues that a main objective of a high school English course should be to foster an enjoyment of literature, and suggests teaching only those works about which students and teacher alike can feel enthusiastic. Hook and Evans (1982) offer three reasons for reading (and teaching) literature: "for pleasure, for information of a kind not available in an encyclopedia, and for a means of sharing our cultural heritage" (p. 126), and emphasize the reader-response method as a way of maintaining student involvement. Judy (1981) devotes an entire chapter of his textbook to "Personal Engagement with Reading and Literature," and states that although "analysis and criticism are not in opposition to a reader-centered program literature/reading program, and it must be placed in the context of--really in subservience to--the young person's engagement with the material" (p. 156).

An analysis of the content of English Journal, the major periodical for high school English teachers, in the past five years reveals different emphases than were found in College English. Where less than 20% of the college journal's articles on literature could be classified as "how-to-teach" articles, 35% of English Journal's literature articles have this focus. But there is an even larger focus in English Journal on what to teach--nearly half (49%) of the journal's articles on literature deal with topics such as the canon, curricular choices, and censorship problems. The journal publishes a few critical analyses (14% compared to 25% in College English) and even fewer articles discussing critical theories (3% compared to 17% in College English).

English Journal has in recent years published a number of articles which attempt to translate reader-response and other types of theory into classroom practice. Authors of these essays frequently cite Rosenblatt, Bleich, Holland, and Fish and tend to explain ways in which the reader can become a more central figure in the literature discussions, interpretations, and writings of the high school English class.

Robert E. Probst has written two articles connecting reader-response theory and the classroom. In "Mom, Wolfgang and Me: Adolescent Literature, Critical Theory and the English Classroom"

(1986) he discusses theoretical arguments by Iser and Rosenblatt that have led us to question the centrality of the text and the notion that meaning is an object to be extracted from it. Agreeing with Iser (1978) that "meaning . . . is an effect to be experienced" (p. 10), Probst suggests using young adult books in the classroom, "literature that will awaken them, make them aware of differences, and compel--or invite--them to engage the text actively and creatively" (p. 35), and provides an example of how the discussion on a particular novel might unfold. In "Three Relationships in the Teaching of Literature" (1986), Probst examines what three types of literary theorists (reader-response, reception aesthetics, and structuralists) have to say about the relationships between reader and text, reader and reader, and text and text, respectively, contrasting these with the traditional view of such relationships in the high school classroom.

Neuman (1986) uses reader-response theory and recent research in reading and mass communication to make the case that censorship is negative and, indeed, pointless. Blake and Lunn (1986), in reporting on a study in which five students were asked to read and come to an understanding of a poem on their own, make sense of their results by referring to Bleich, Holland, and Rosenblatt, and discuss the classroom implications of their work. Fowler and McCormick (1986), with the goal of helping students become "confident, critical, and self-conscious readers of literature" (p. 47), suggest a reader-centered method of teaching a unit on metamorphoses in literature. In several other articles (e.g., Williams, 1986; Pradl, 1987), reader-response methods are advocated without being specifically named.

A few other critical perspectives make brief appearances in the pedagogical literature at the high school level. Dilworth (1983) introduces structuralist theory and related reading research on story grammars. Scanlon (1986) again introduces structuralism and shows how it can be applied to the reading of four short stories. McGinty (1987) applies the techniques of deconstruction to the analysis of a film, Citizen Kane. Shuman (1984), while acknowledging that few high school teachers have the time or energy to become conversant with the varieties of current literary theory, offers descriptions of the various movements and a brief bibliography of those works likely to be the most accessible.

As in the pedagogical literature at the college level, few writers address the question of how students are to pass beyond the level of personal response to learn how to formulate a literary argument. One who does is Tanner (1986), who in "Education by Criticism" suggests that although a traditional goal of education has been "to teach students to think critically: to question, probe, analyze, explain, and evaluate" (p. 22), students rarely acquire these skills during high school, and they seem particularly deficient when it comes to engaging in literary criticism. Tanner appears to feel that both the text-based New Critical and the reader-based models of pedagogy have

left students with misconceptions regarding the nature of criticism: Many students believe that criticism furnishes correct answers ("the answers in the back of the book") and that the teacher is the guardian of these answers. At the same time, other students believe that there are no right answers, that one person's answer is just as good as another's, that "it's all relative to your point of view." Tanner suggests that both types of misconceptions might be eliminated by having students work with two examples of critical arguments that represent conflicting positions. For their assignment, students must identify an important issue in the interpretation of a work, locate two critical articles that conflict with one another, and formulate their own conclusions. Through such an exercise, students may learn that arguments are sometimes not as convincing as they appear at first glance, that arguments may be biased in particular ways, or that two "correct" interpretations of a work may peacefully coexist. They will also learn that their arguments, if "persuasive and reasonable," will have equal validity.

Kahn, Walter, and Johannessen (1984), drawing on Toulmin's (1969) work in a booklet entitled Writing about Literature, point out that students are not often taught "how to turn . . . initial responses into meaningful essays of interpretation" (p. 10). They state that an effective argument will contain three parts: claims (conclusions about the work); data (evidence to support the claims); and warrants (explanations of how the data support the claims). They offer a series of exercises designed to guide students through several different interpretation sequences. For example, in one sequence students begin by identifying their own views on a particular subject (in the example, what makes a good parent), then move into evaluating the evidence of others and generating their own (to argue that Atticus in To Kill a Mockingbird is/is not a good parent), and to creating effective warrants to link their claims with their evidence. Finally they apply the skills they have acquired to the question of whether another character of their choosing is or is not a good parent.

Kahn, Walter, and Johannessen offer a good example of how students might be helped to develop an interpretive argument; they provide a clear scaffold within which students may first develop their skills and then apply them in new situations. They occupy a somewhat unique position in the high school (and college) pedagogical literature in that they make the transition between thinking and writing, but their highly structured approach is extremely text-based and seems to focus on understanding what an author "means" in a work ("Write a statement of the author's [poet's] generalization") rather than on how an individual reader can come to a well-reasoned interpretation through a transaction with the text. Thus despite their stated intention, Kahn, Walter and Johannesson do not really offer a way for students to move from personal response to argument.

Summary

Several important points emerge from our review of theoretical and pedagogical writing in the discipline of literature. First, current literary theory is distinguished by a pluralism of which there is essentially no acknowledgement in the pedagogical literature. Very few writers in pedagogical journals advocate bringing any theory other than reader-response into the classroom; only McCormick (1985) suggests having students engage in several different kinds of interpretations (and it is not clear whether she actually informs students that they are employing the methods of various schools of criticism). Thus students of literature may not become aware that in this field there are different opinions about ways of knowing, with more than one kind of acceptable evidence and more than one way to approach an argument.

The growing attention to translating reader-response theory into the literature classroom is a positive development, since it clearly signals an emerging interest in the thinking process, in how we come to know a work of literature, rather than the product, what we know about a work. But at this point attention seems focused on the initial stages of response, on a reader's first interaction with the text, and stops short of working out how a reader might move toward a more formally expressed interpretation. In fact, there appears to be a strong sentiment against such kinds of analysis; many writers, particularly at the high school level, argue for engagement, for creating readers rather than interpreters of literature.

Clearly, focusing on personal response represents an essential first step toward literary understanding; many theorists (e.g., Rosenblatt, 1978; Britton, 1982; Bruner, 1986) have argued that since literature, unlike expository forms of discourse, has as its purpose the evocation of affective response, any means to understanding it that ignores the individual's experience of the work will be deficient. But if the goal of a college--and high school--literature class is the development of disciplined thinking that most high school students currently lack (Applebee, Langer, & Mullis, 1985, 1986a, 1986b), we must move beyond the stage of feeling that engagement with and appreciation of literature is enough. The student-centered approach advocated in the pedagogical literature is an obvious improvement over the old model that saw the teacher transmitting and students receiving information about symbols and themes in stories and poems, but students must also be assisted in the process of turning a personal reaction into a rich, well-expressed understanding of a literary work. We need not return to the New Critical classroom with its long lists of technical terms and "scientific method" of knowing a poem, but we must develop scaffolds that will assist students in moving to a higher level of analysis and in expressing these complex interpretations. Perhaps drawing closer connections between literary theory and the pedagogy of literature study will assist

us in this task.

Looking across the three literature reviews we undertook in strand one of this study, it becomes quite clear that although there are differences in both the theoretical and pedagogical emphases among the three disciplines, in each case the literature on practice reflects little of the underlying principles that are guiding the discipline-based scholarship. In all three cases the scholarly fields have moved from a belief in the accumulation of knowledge toward one based on the tentative nature of truth, and toward a call for questioning, inquiry, and interpretation as continuing processes in coming to understand. The pedagogical works in biology and history seem to focus on content, not on ways of thinking about that content. The goal appears to be more a passing on of critically perceived knowledge in the field than on teaching students to think like biologists or historians who can gather, reflect on, and communicate knowledge on their own. In contrast, pedagogy in literature seems to have moved beyond the structuralists' notions of a correct interpretation of a text, having embraced reader response criticism as the basis for instruction in active inquiry.

However, pedagogical concerns and teachers' goals are not necessarily the same. In the following chapter we will present findings of the analyses of the teachers' responses to the questionnaire and interviews which were designed to tap their own experiences in their fields, their course practices and goals, and the criteria they use for judging student performance.

Chapter 6

Teachers' Talk About Knowing

Our review of the literatures in the three fields of study indicates that there has been a substantial reconceptualization of knowing in each field, moving away from belief in established and verifiable truths and toward emphases on the continuing process of coming to understand, from a variety of perspectives. In biology and history, there is indication that these discipline-based concerns are also the concerns of educational scholars, but less so those of the instructional communities as reflected in journals of teaching. In contrast, some of these concerns appear in articles on the teaching of literature, with reader-response theory as the predominant basis of instructional methodology. Strand two of our work, on teachers' talk about knowing, was undertaken to move beyond the writers in the various fields -- to learn about teachers' concerns, emphases, and instructional goals -- from their points of view.

The teacher's questionnaire and interviews permitted us to identify points of similarity and difference within and across subject areas and instructional levels. Although general similarities in views of instruction and the display of knowledge were evident across all the teachers we interviewed, differences among subject areas also remained prominent.

Three major findings emerged from the analyses reported in this chapter: 1) All teachers said they wanted their students to reason about what they were learning, but the predominant focus of their comments was on the acquisition of facts; 2) In addition to the obvious discipline-specific nature of the content they talked about, the teachers' comments about discipline-related thinking also differed; 3) In addition to the different ways in which they discussed general learning and knowing in their subjects, the focus of the teachers' comments about effective student writing also differed by field. Each finding will be discussed and elaborated in turn.

> Finding One: All the teachers interviewed wanted their students to think -- to engage in deeper thinking about the content --, and to arrive at more comprehensive understandings of the course material. However, they were more likely to talk about such emphases when discussing abstract goals, and more likely to talk about specific content when dealing with the day to day details of teaching and learning.

The first finding has two parts, one related to the goals that teachers' espouse for their courses, the other related to the emphases that develop in carrying out those goals. We will look at each in turn.

Teachers' Goals

Value of Studying the Discipline

Several questions asked teachers about the value of studying their discipline in general, or a specific course in particular. Table 6.1 summarizes responses related to the value of the discipline as a whole. Overall, the majority of teachers saw the primary value of their subject area in its ability to help students to better understand their own lives or the society in which they lived. They claimed that their subjects would develop "a sense of history," a "critical attitude," or a "sensitivity to others around them" that would make them better able to function in their personal and social worlds. At this level, very few of the teachers mentioned specific content that they felt would be important, nor did many elaborate upon "understanding society" or "relating to their own lives" with specific comments about learning the values of specific types of evidence and argument.

Value of A Particular Course

A second set of questions asked teachers what they expected students to know at the end of a particular course (interview 1). Responses are summarized in Table 6.2.

Teachers' comments showed little concern with specific content that students should take away, focusing instead on the importance of developing an awareness of major issues and themes, fostering "appreciation" of the subject, and providing them with the ability to function on their own within the disciplinary arena (reflected in a focus on evaluating evidence, understanding new issues, raising questions, and writing within the discipline).

Value of Studying a Particular Unit

As well as general questions about the goals of the study of their discipline or course as a whole, teachers were also asked what they hoped students would learn from a specific unit of study (interview 2). Responses to this much more specific question are summarized in Table 6.3.

Table 6.1

Specific Values of Studying the Discipline

Value	Percent of Teachers Mentioning					
	Biology		History		Literature	
	High School (n=8)	College (n=8)	High School (n=8)	College (n=10	High School (n=6)	College (n=8)
Knowledge of Specific Content	25.0	25.0	12.5	0.0	16.7	12.5
Understanding Society	25.0	100.0	100.0	90.0	83.0	100.0
Understanding One's Own Life	100.0	50.0	37.5	0.0	33.3	37.5
Learning Specific Ways of Thinking	25.0	25.0	12.5	20.0	16.7	12.5
Developing Values	12.5	12.5	25.0	30.0	66.7	50.0

Table 6.2

What Students Should Know at the End of the Course

	Percent of Teachers Mentioning					
	Biology		History		Literature	
Type of Knowledge	High School (n=8)	College (n=8)	High School (n=8)	College (n=10)	High School (n=6)	College (n=8)
Specific Content	12.5	0.0	0.0	20.0	0.0	12.5
Awareness of Major Issues/Themes	25.0	87.5	75.0	40.0	16.7	62.5
Understand New Issues	37.5	50.0	25.0	30.0	33.3	0.0
Examine Evidence	37.5	37.5	12.5	60.0	50.0	12.5
Raise Questions	12.5	0.0	12.5	40.0	0.0	0.0
Writing Skill	12.5	0.0	0.0	10.0	16.7	0.0
Appreciation of the Subject	87.5	62.5	50.0	50.0	16.7	62.5
Understanding of Self	12.5	12.5	0.0	0.0	16.7	25.0

Table 6.3

What Students Should Take Away From a Particular Unit

	Percent of Teachers Mentioning					
	Biology		History		Literature	
	High School (n=8)	College (n=7)	High School (n=8)	College (n=8)	High School (n=6)	College (n=8)
Specific Content	50.0	42.9	25.0	12.5	0.0	25.0
Understand Broad Concepts	37.5	85.7	87.5	62.5	50.0	50.0
Understand Society	0.0	0.0	37.5	50.0	16.7	37.5
Specific Ways of Thinking	25.0	14.3	25.0	50.0	33.3	12.5
Ways of Presenting/Organizing	0.0	28.6	0.0	0.0	16.7	0.0
Technical Skills	37.5	28.6	0.0	25.0	66.7	37.5
Interests, Values	12.5	28.6	25.0	25.0	66.7	50.0

In the context of a particular unit of study, teachers focused most on broad concepts and specific content that they hoped students would take away from their study. There were, however, some interesting differences among the emphases within different subject areas. The biology teachers placed more emphasis than their colleagues on knowledge of specific content included in the unit; the history teachers placed more emphasis on understanding society and (at the college level) on specific ways of thinking (in this case emphasizing drawing inferences from historical evidence); and the literature teachers emphasized student interests and values and (at the high school level) the development of technical skills (how to interpret literary passages).

Overall, looking across their responses to these and related questions, the teachers goals for study of their subjects were usually quite broad: they focused on understanding broad concepts that students could use to make sense of their lives and their world, and only incidentally on specific content or technical skills. On the other hand, their language for talking about the application of those broad concepts was quite limited, with little attention to developing specific ways of thinking or facility with the kinds of argument and evidence that might underlie the realization of their broader goals.

How Goals Are Carried Out

Emphases in Discussions of Influences on Teaching

In this study, we examined how teachers' goals were carried out by asking a variety of questions about how teachers went about their teaching-- the factors that influenced their decisions, the general approaches they used, and the specific choices they made in teaching a particular unit of study. One set of questions asked participants about the factors that had shaped the content and approaches they used in their own teaching. Comments in response to these questions are summarized in Table 6.4.

The most important influences that the teachers reported were their experiences with other teachers, as opposed to coursework they had taken, their work with their own students, or their response to new ideas that they had encountered. The following examples are typical of the comments they made:

> High School - "I've definitely been helped by my colleagues as we exchange ideas, methods, etc. "
>
> College English "I had some excellent teachers who strongly influenced me to become a teacher by their examples."

Table 6.4

Teachers' Reports of Influences on Their Teaching

	Percent of Teachers Mentioning					
	Biology		History		Literature	
	High School	College	High School	College	High School	College
Teachers	85.7	100.0	62.5	71.4	66.7	75.0
Observing Students	50.0	25.0	28.6	20.0	16.7	0.0
Courses Taken	20.0	0.0	50.0	25.0	83.3	0.0
Ideas Encountered	20.0	50.0	50.0	33.3	20.0	37.5

College English - "I have made it a practice to sit in on courses taught by my colleagues in other departments. They have been an inspiration for me to develop the methods of fresenting materials. Also, I have been influenced by my teaching assistants in English composition who often seem to have new and valuable approaches to teaching."

While they clearly were aware of a variety of ways in which they had been influenced by others in their profession, the teachers in each of the fields focused their comments on the content they had learned or on instructional approaches they had learned; not one teacher commented on the ways in which others in the field affected how they thought about the field as a whole or how others had influenced them to reason about ideas in new or different ways.

To follow up on this, the teachers' discussions of influences on their teaching were also analyzed in terms of the topics they discussed, in particular the amount of emphasis on specific content, ways of thinking, or students' engagement in the learning process. These analyses are summarized in Table 6.5.

Overall, the teachers gave most emphasis to specific content they incorporated into their teaching, and least emphasis to the ways of thinking specific to their subject area. Many of them also gave considerable attention to techniques for engaging students' interest.

There were also some consistent differences in emphasis between high school and college teachers. In all three subject areas, the college teachers focused somewhat more heavily on content:

Harvey, College Biology -- "A wide range of courses in the fields of biology and microbiology were helpful in giving me the facts that have been the basis of my teaching."

Jack, College English - "My courses qualified me to teach by forcing me - or giving me the opportunity- to acquire the necessary information that I in turn would impart to the students. They determined my whole approach to teaching, and scholarship as well."

The high school teachers, on the other hand, gave more attention than the college teachers to teaching approaches that would engage students more effectively in the learning process:

Matthew, H.S. English - "In graduate school, I had a master teacher who guided me through the rigors of the teaching process. He was an enormous help and a valuable source of methods and approaches."

Table 6.5

Ratings of Teachers' Emphasis in Discussing Influences on Their Teaching

Emphasis	Means (SD) (1)		
	Biology (n=13)	History (n=15)	Literature (n=14)
Specific content			
High school	4.0 (.8)	3.5 (.9)	3.5 (1.4)
College	4.6 (.5)	4.7 (.8)	4.1 (1.6)
Engaging students			
High school	2.4 (2.1)	2.3 (1.9)	3.0 (1.5)
College	2.8 (1.8)	1.0 (1.7)	1.0 (1.9)
Ways of thinking			
High school	0.0 (-)	0.5 (1.4)	1.2 (1.8)
College	0.8 (1.8)	2.7 (2.1)	2.8 (2.4)

ANOVAs

Effect	df	F-statistics		
		Content	Ways of thinking	Engaging students
Subject	2;36	0.78	2.49	0.63
Level	1;36	5.94*	8.30**	2.96
Interaction	2;36	0.36	0.55	1.50

* $p < .05$
** $p < .01$
*** $p < .001$

(1) Degree of emphasis rated on a scale from 0 (low) to 5 (high).

Kate, H.S. Biology - "In my third year of teaching, I taught with a highly organized, strongly motivated science teacher who will leave his mark. His pride and dedication along with his skill in managing the class influenced me more than any college class."

A few teachers, particularly at the college level, did focus some of their attention on rules of evidence or argument, on ways of thinking, but they usually did not elaborate much on this topic. For example:

Sean, College History - "Writing seminar papers and analyzing the works of peers in the course benefited my teaching by allowing me to analyze in-depth the written works of other students."

Fred, College English - "Certain books I've read have caught my imagination or so convinced me - that I've incorporated their doctrine or attitudes into my own work. [I've also been influenced by] One or two colleagues from whom I have learned something useful to my teaching or intellectual development.

Jessica, College History - "I was influenced by one of my professors. He was a splendid reader of papers and exams - took care to comment on content and style and contributed significantly to my ability to write history.

"Analyzing," "intellectual development," "ability to write" are samples of words and phrases that we heard fairly often across the various interviews. But they were left unelaborated, and never explained in terms of what they meant in relation to the teachers' own thinking or that of their students.

Emphases in Discussions of the Curriculum in General

Similar emphases were evident when the teachers were asked during the first interview to talk about their curriculum in general. Their responses are summarized in Table 6.6.

In responding to these questions, the high school teachers tended to talk about coverage of specific content and the college teachers tended to talk about the themes or ideas in the curriculum, but neither tied these concerns to accepted modes of reasoning and argument within their subject areas. Differences between subject areas were also evident, with the biology teachers (and to some extent the high school history teachers) placing more emphasis than did their colleagues on coverage of specific content.

Table 6.6

Teachers' Emphasis in Discussing Their Curriculum in General

Emphasis	Means (SD) (1)		
	Biology (n=13)	History (n=15)	Literature (n=14)
Specific content			
High school	4.8 (.5)	4.1 (.8)	2.7 (.8)
College	4.0 (1.2)	2.4 (1.1)	2.0 (.8)
Engaging students			
High school	3.4 (1.6)	3.4 (1.6)	3.7 (2.0)
College	2.8 (1.3)	3.4 (1.1)	1.3 (1.6)
Ways of thinking			
High school	2.0 (1.4)	1.3 (1.9)	2.0 (1.7)
College	1.6 (1.5)	2.3 (.5)	1.1 (1.2)
Themes/ideas			
High school	9.0 (1.6)	0.9 (1.6)	1.7 (2.0)
College	1.8 (1.8)	3.3 (1.5)	3.6 (1.6)

ANOVAs

Effect	df	F-statistics			
		Content	Themes/Ideas	Ways of thinking	Engaging
Subject	2	16.90***	1.73	0.19	1.57
Level	1	15.30***	11.97***	0.01	3.92+
Interaction	2	1.53	0.68	1.71	2.39
error	36				

\+ p < .10
* p < .05
** p < .01
*** p < .001

(1) Degree of emphasis rated on a scale from 0 [low] to 5 [high].

Emphases in Discussions of Particular Units of Study

The final set of responses to consider here come from teachers' discussions of particular units of study. In considering these discussions, we examined 1) the teaching methods and materials used, 2) the emphases in comments about what was taught, and 3) the methods of evaluation.

Table 6.7 summarizes the teaching methods and materials used while teaching the particular units discussed. All of the teachers made use of assigned readings, and almost all paired these readings with lectures and discussions focused on the major content to be covered. In literature classes, particularly at the high school level, these were likely to be accompanied by class discussions that also focused on student concerns, or by small group activities. Biology classes made particular use of objective exercises, and all 3 subjects were likely to require formal writing, at least at the college level. (At the high school level, only two-thirds of the literature and history teachers and one-third of the biology teachers included writing in the units they described.)

Overall, the picture that emerges is of a relatively traditional approach to instruction, with lectures and teacher-led discussion playing the dominant role, and more student centered activities appearing less frequently. Literature classes seemed somewhat more likely to break away from this pattern, biology classes (except for a continuing emphasis on laboratory work) somewhat less likely to do so.

Given these approaches to instruction, what do teachers focus on as they discuss particular units? The relevant data are summarized in Table 6.8.

In contrast to their discussions of the value of studying their subject, when they discuss the details of particular units of study teachers of biology and history give considerable attention to the particular content included, and somewhat less attention to ways of thinking about that content. Literature teachers at both levels showed the least concern with specific content, and the most with ways of helping students think about the works they were reading. In all three subject areas, high school teachers gave somewhat more attention than did college teachers to techniques for insuring students' interest and engagement.

The way teachers evaluate what students have learned provides another good indication of what counts as knowing within their classrooms. Teachers' reports of the kinds of evaluations they used for particular units are summarized in Table 6.9.

Table 6.7

Instructional Methods and Materials Mentioned in Discussing a Unit of Study

	Percent of Teachers Mentioning					
	Biology		History		Literature	
	High School (n=8)	College (n=7)	High School (n=8)	College (n=9)	High School (n=6)	College (n=8)
Lecture	100.0	100.0	87.5	100.0	83.3	100.0
Assigned Readings	100.0	100.0	100.0	100.0	100.0	100.0
Content-Based Discussion	100.0	57.1	87.5	100.0	50.0	75.0
Student-Based Discussion	25.0	0.0	37.5	0.0	67.7	37.5
Small Group Activities	50.0	14.3	50.0	11.1	67.7	12.5
Media	37.5	28.6	75.0	33.3	50.0	12.5
Formal Writing	37.5	85.7	62.5	100.0	66.7	100.0
Personal Writing	12.5	0.0	12.5	0.0	66.7	12.5
Objective Exercises	100.0	71.4	87.5	44.4	33.3	37.5

Table 6.8

Overall Emphasis in Teachers' Discussions of Particular Units of Work

Emphasis	Means (SD) (1)		
	Biology (n=15)	History (n=17)	Literature (n=14)
Specific content			
High school	4.6 (.5)	4.4 (1.4)	2.2 (1.3)
College	4.4 (1.5)	4.3 (1.1)	3.6 (.7)
Engaging students			
High school	3.5 (1.8)	4.4 (1.4)	4.3 (1.0)
College	3.0 (1.4)	2.1 (1.5)	2.3 (1.8)
Ways of thinking			
High school	2.3 (1.6)	2.1 (1.5)	3.7 (1.8)
College	2.9 (2.0)	4.0 (1.2)	3.4 (1.4)

ANOVAs

Effect	df	F-statistics		
		Ways of thinking	Content	Engaging students
Subject	2;40	1.16	8.08***	0.00
Level	1;40	3.02	1.13	12.97***
Interaction	2;40	1.85	2.29	1.53

* p < .05
** p < .01
*** p < .001

(1) Degree of emphasis rated on a scale from 0 [low] to 5 [high].

Table 6.9

Teachers' Ways of Knowing What Students Have Learned From a Unit

	Percent of Teachers Mentioning					
	Biology		History		Literature	
	High School (n=8)	College (n=7)	High School (n=8)	College (n=9)	High School (n=6)	College (n=8)
Objective Tests	87.5	100.0	62.5	55.6	33.3	25.0
Extended Writing	12.5	57.1	50.0	100.0	100.0	100.0
Class Discussion	37.5	28.6	87.5	55.6	50.0	37.5

The reports in Table 6.9 indicate considerable difference among the three subject areas. Biology teachers at both levels make extensive use of objective tests, which are likely to focus on very specific items of content. Literature teachers, on the other hand, reported much less use of such tests, and a corresponding increase in the use of formal writing assignments as a way to assess what students have learned. History classes fell somewhere in between, with over half reporting use of objective tests, but the majority also reporting use of extended formal writing.

The kinds of knowledge teachers emphasized as they discussed their approaches to evaluation are summarized in Table 6.10. Again, the biology and history teachers place particular emphasis on specific content, while the literature teachers placed more emphasis on understanding of broad themes or concepts, and somewhat more on the ability to master appropriate modes of reasoning and argument (extension to new situations, use of evidence, structure of argument).

Overall, teachers' discussions about how they carried out their goals in their classrooms reflect a continuing concern with specific content, and much less overt attention to appropriate forms of argument and evidence within their particular discipline. The one exception to this may be the teachers of literature, who often avoid emphasizing particular content and pay more attention to the arguments students are building. Even for them, however, the general picture is of a commitment in the abstract to teaching ways of thinking, and a failure in practice to find comfortable ways to emphasize these goals.

> Finding Two: When they did talk about thinking, teachers in the different disciplines spoke about it differently; they used a common language that was specific to their fields. In most cases this language was neither well developed nor elaborated upon, but it provides a starting point for considering discipline-specific approaches to argument and evidence.

Two questions asked as part of the first interview encouraged teachers to talk directly about the kinds of reasoning and justifications their students should use, and about the kinds of evidence that were appropriate to their fields. In responding to these questions, everyone showed concern for student involvement in thinking things through, and spoke from the vantage point of their own discipline.

Table 6.10

Teachers' Emphasis in Discussing Their Evaluations of What Students Have Learned

	Means (SD)		
	Biology (n=14)	History (n=12)	Literature (n=11)
Specific content			
High school	2.1 (2.0)	2.0 (2.7)	0.0 (0.0)
College	4.5 (.8)	3.1 (2.2)	1.3 (1.9)
Understanding of themes or concepts			
High school	1.3 (2.1)	0.2 (0.4)	1.8 (2.5)
College	1.5 (2.1)	1.9 (1.7)	2.2 (2.1)
Structure of argument			
High school	0.3 (0.5)	0.2 (0.4)	0.4 (.5)
College	0.8 (1.6)	0.0 (0.0)	0.8 (2.0)
Extent of evidence, support			
High school	0.8 (1.8)	0.0 (0.7)	1.6 (2.3)
College	0.3 (0.8)	0.7 (1.9)	0.0 (0.0)
Extension to new situations			
High school	0.1 (0.4)	0.0 (0.0)	1.0 (2.2)
College	0.8 (2.0)	0.0 (0.0)	0.7 (1.6)
Technical skills			
High school	0.3 (0.5)	0.0 (0.0)	1.2 (2.2)
College	2.2 (2.1)	0.0 (0.0)	0.2 (0.4)

Table 6.11 summarizes the kinds of reasoning and interpretation mentioned most frequently by teachers in each of the three disciplines; Table 6.12 summarizes related data about the types of evidence they mentioned as appropriate. The lists are striking for their diversity, each reflecting a discipline-specific orientation in the kinds of language chosen to talk about appropriate approaches.

Even so, the terminology used to categorize responses in Tables 6.11 and 6.12 is somewhat generalized, and masks some of the subject-area specificity reflected in the actual language the teachers used. Our discussion below brings together findings from qualitative as well as quantitative analyses in order to highlight these subject-specific differences.

The history teachers talked about recognizing contradictions, having a critical bent, understanding the logic of history, looking at circumstances, taking sides on controversial issues, providing supporting evidence, and distinguishing true and false positions:

> Theo, College History - "[I want them] to recognize contradictions and make an attempt at trying to figure out relationships between contradictory developments. Also to have a critical bent- to be able to criticize what they read and what they hear.
>
> [In giving evidence or justification] I warn them about being abstract. 'Society caused it to happen...' I want them to say who .... The logic of history is straightforward - simply a matter of taking into account when things happened. Look at the circumstances and the context."
>
> Jane, U.S. History - [I want them to be] "able to tell me in writing what they've read and to recognize the main points as distinct from the sub-points. To take a side on a controversial issue and find supporting evidence. To distinguish between good thinking and fallacious positions."
>
> When asked about the kinds of evidence her students should use, she said, "I expect them to raise issues and flesh them out with details -- to give at least three different types of reasons relevant to the issues and to give details to support those reasons."

The biology teachers talked about making connections, reasoning logically, thinking critically, using facts and data, avoiding opinions, establishing validity, hypothesizing, and presenting findings, arriviving at probable conclusions, predicting outcomes, synthesizing and proving or disproving hypotheses:

Table 6.11

Kinds of Reasoning and Interpretation Mentioned by 15% or More of the Teachers

Biology		History		Literature	
75.0%	Hypothesis Testing	66.7%	Draw Conclusions	42.9%	Find Sufficient Evidence
56.3	Scientific Method	38.9	Reason, Think	35.7	Analyzing
37.5	Data Collection	33.3	Reading Comprehension	28.6	Analyze Style
33.3	Draw Conclusion	27.8	Cause and Effect	28.6	Interpret
33.3	Reason, Think	27.8	Find Supporting Evidence	21.4	Reason, Think
31.3	Graphs	22.2	Reading Comprehension	21.4	Analyze Motives
26.7	Recall Facts	16.7	Recall Facts	21.4	Reading Comprehension
26.7	Interpret			21.4	Analyze Values
25.0	Analyzing			21.4	Compare and Contrast
18.8	Problem Solving				
18.8	Cause and Effect				
18.8	Measurement Error				
18.8	Probability				
18.8	Application				

Table 6.12

Types of Evidence Mentioned as Appropriate by 15% or more of the Teachers

Biology		History		Literature	
93.8	Observation	72.2	Primary Texts	92.9	The Works Themselves
87.5	Experiment	47.1	Testimony (to be Evaluated)	50.0	Supporting Examples
25.0	Statistics	41.2	Authority (Secondary Sources)	28.6	Student Experience
		23.5	Strong Arguments		
		17.6	Supporting Examples		
		16.7	Student Experience		

Jackson, H.S. biology- "I'd like them to make connections, to reason logically, to think critically. To take facts and apply them to problem-solving situations or to develop a research experience in the lab."

About justification or evidence, he said "they should use facts, data - reliable data they've found. They should shy away from opinion without establishing the validity of the source. Be able to hypothesize, and present findings."

Robert, College Biology - "I expect them to be able to make probable conclusions from certain kinds of questions that are raised. I really mean predict outcomes, which in essence, would be hypothesis. Conclusions will prove or disprove the hypothesis. Reasoning is their thinking in terms of taking a problem, thinking about possible outcomes, using logical reasoning and then being able to synthesize to prove or disprove the case."

About evidence or justification he said, "I want them to come up with evidence that's reliable and repeatable. Tangible evidence. It would come from the experimental set-up and go into a chart or graph."

The English teachers talked about having a sense of major themes and motifs, seeing what the author evokes, responding to the reading, using the text to support ideas and making relationships, interpreting, analyzing, contrasting personal and literary values:

Matthew, College English - "I want them to have a sense of major themes and motifs in literature, that they're touched with the wholeness of the work. Its primary for them to have an idea of what the author evokes. But of equal importance are their own responses to their reading, to involve themselves in the work and recreate it in their own minds -- not just to be critical analysts."

About justification or evidence - "They can start out with points from the novel - some are clearer than others - used to support their ideas. To know the incident and see how it relates."

Esther, H.S. English - [I expect them to] "Interpret- What would you think about the choices the characters made; would you have done the same things ... and to analyze - with honors kids I have them analyze the literary style-- and with the others I have them analyze the values of literature with their personal values.

Justification has been a dilemma for me, training kids to do this. For practice we deal with 'why' questions...keep going back and forth between text and reader, but keep coming back to the text."

Although all of the teachers had some language to talk about the kinds of reasoning appropriate to their subject area, the Biology teachers, with a long tradition of discussion of the scientific method, seemed to have a somewhat richer vocabulary to draw upon. To examine this directly, we also examined the number of specific, different constructs each teacher used in the course of responding to this set of questions. These constructs were tabulated in three sets: subject-specific approaches (e.g., probability, analysis of character motivation, historical necessity), generalized generic constructs (e.g., reasoning, thinking), and specific generic constructs (e.g., cause and effect). The results, summarized in Table 6.13, show no differences among subjects in the availability of a generic vocabulary for discussing ways of reasoning, but a very significant difference in the availability of a technical vocabulary within the subject area for discussing such issues. In particular, the biology teachers could draw on a long tradition of discussion of the scientific method, while the history and literature teachers had no similar traditions to use. The results also indicate that high school and college teachers had comparable vocabularies to draw upon, with no significiant differences between the two groups.

To summarize: Each teacher had a discipline-specific emphasis in the language they used to talk about at least some kinds of reasoning they expected their students to do, and notions of evidence or justification they wished their students to learn to use. This general, but discipline- specific, language seemed to capture real differences in the ways of thinking that are typically required in the three disciplines. But what seemed to be lacking was the teachers' ability (or expressed desire) to operationalize these broad notions in terms of procedures that would help anyone who did not already know how to "analyze" or "hypothesize" or "interpret." The attempts the teachers did make were relatively superficial, as with Theo who wants his students to be specific and say "who," Jane who says they should give three reasons for every point, Robert who says they should predict outcomes, or Jack and Esther who say the students should get evidence from the text.

Table 6.13

Types of Arguments and Evidence Cited by Teachers as Appropriate to Their Discipline

	MEANS (SD)		
	Biology (n=15)	History (n=18)	Literature (n=14)
Types of Thinking Strategies			
Subject Specific			
High School	1.7 (.8)	.6 (1.4)	1.0 (1.1)
College	2.9 (1.7)	0.0 (-)	.8 (1.0)
Generic: Generalized			
High School	2.1 (1.1)	1.3 (.9)	1.5 (1.9)
College	1.3 (1.0)	1.7 (1.1)	1.4 (1.2)
Generic: Particular			
High School	.6 (1.1)	1.0 (1.2)	.3 (.5)
College	.5 (.8)	.6 (.8)	.3 (.5)
Types of Evidence			
High School	2.7 (1.1)	3.1 (1.2)	2.5 (1.2)
College	2.6 (.7)	3.8 (1.5)	3.0 (1.9)
Total Arguments and Evidence			
High School	7.9 (3.1)	6.0 (3.0)	5.3 (3.0)
College	7.3 (3.2)	6.1 (1.7)	5.4 (2.9)

ANOVAS

Effect	df	F - Statistics				
		Thinking Strategies				
		Subject Specific	Generic Generalized	Generic Particular	Evidence	Total
Subject	2;41	14.22**	0.15	1.81	1.89	1.61
Level	1;41	0.03	0.19	0.23	0.93	0.05
Interaction	2;41	2.75	1.31	.64	1.09	0.02

* p < .05
** p < .01
*** p < .001

Finding Three: The teachers from the three disciplines also responded to student writing in discipline-specific ways. Some focused on content and surface presentation, but some also focused on ways of thinking about the content, at least to some degree.

To investigate how teachers' instructional emphases related to their responses to student work, each teacher was asked to provide samples of good and poor papers from the unit that was discussed in detail. They were asked to discuss strengths and weaknesses in each paper, and to compare them to one another.

We carried out a content analysis of the teachers' comments in response to each paper, focusing on the types of features that the teachers felt important enough to point out. Table 6.14 summarizes the types of comments that were made most frequently in each subject area. Table 6.15 summarizes these responses in terms of the average number of student-oriented, content-oriented, and thinking-oriented constructs that each teacher used in discussing the set of papers.

The results in Tables 6.14 and 6.15 show some interesting differences between subjects and levels in the types of responses the teacher were most likely to make. Biology teachers placed the most emphasis on the accuracy and completeness of the content of their students' papers, averaging 3 to 4 times as many such comments per paper as did their colleagues in history and literature. History and literature teachers, on the other hand, placed more emphasis on the nature of the argument and evidence that their students offered, paying considerably less attention to specific content. Teachers in all groups made a few references to student-oriented concerns (e.g., degree of involvement or interest displayed in the topic), but these were especially prominent in the responses of the high school literature teachers.

In all subjects, high school teachers were more likely than college teachers to emphasize content, and college teachers were more likely to emphasize the structure and quality of argument.

We can explore these generalized patterns further by examining the responses of specific teachers. For example when Theo, a college history teacher, discussed an A paper, he said the following:

> He began by talking about the subject. He discussed the notion of how Paine had problems with the monarchy. He demonstrates knowledge of what Paine said. And does same thing with Mrs. Stowe. He talks about her ideas of morality. At end he ties the two together. He took two documents and sees similarities and used them to answer the question asked of him.

Table 6.14

Types of Comments Made by 15% or More of the Teachers in Discussing Student Papers

Biology (n=14)		History (n=17)		Literature (n=14)	
71.4	Comprehensiveness	94.1	Comprehensiveness	92.9	Comprehensiveness
64.3	Accuracy of Content	76.5	Structure/Organization	85.7	Structure/Organization
	Technical Skills	70.6	Writing Skills	57.1	Originality
	Structure/Organization	47.1	Insight		Insight
	Following Instructions	41.2	Originality	50.0	Writing Skills
35.7	Insight	41.2	Accuracy of Content	42.9	Technical Skills
28.6	Writing Skills	35.3	Connections to Other Content	35.7	Connections to Other Content
21.4	Originality	29.4	Personal Involvement		Personal Involvement
				21.4	Connections to Self

Table 6.15

Teachers' Responses to Good and Poor Papers

	MEANS (SD)		
	Biology (n=14)	History (n=17)	Literature (n=14)
Number of Student-Oriented Comments			
High School	.13 (.4)	.63 (1.1)	1.83 (1.3)
College	.17 (.4)	.89 (.8)	.50 (.8)
Number of Content-Oriented Comments			
High School	2.25 (.7)	.88 (.6)	.67 (.8)
College	1.50 (.8)	.33 (.7)	.50 (.8)
Number of Thinking-Oriented Comments			
High School	1.75 (1.5)	2.88 (1.0)	2.83 (1.47)
College	2.83 (1.3)	3.67 (1.0)	3.87 (1.23)
Total Comments			
High School	4.3 (1.8)	4.6 (.9)	5.3 (1.6)
College	4.5 (1.9)	4.9 (1.5)	5.0 (1.4)

ANOVAS

Effects	df	F-Statistics			
		Student-Oriented	Content-Oriented	Thinking-Oriented	Total
Subject	2;39	4.86**	14.56***	3.37*	0.87
Level	1;39	1.41	4.90	6.75**	0.03
Interaction	2;39	3.86*	0.55	0.07	0.17

* p< .05
** p< .01
*** p< .001

As explanation of a D paper, he said:

> It's stilted, the stumbling syntax reflects no understanding of what the question entails. He's not clear about what Paine had to say. No comparisons between Paine and Stowe. Semi-literate.

In response to our general questions about his conceptions of effective learning, Theo had said that he wants his students to figure out relationships. Further, he commented on this aspect of discipline-specific thinking as evidence of success or failure in their writing.

In contrast, Matthew, a college English teacher described an A paper in this way:

> This student saw the novel differently from the way it was seen in class. She felt it was an allegory of how the mind works. She used good examples from the book, I learned something. I would talk about what she saw if I taught that class again. Validity is in the examples. She's got the basic idea of criticism - you present an idea and give evidence. Wrote well too.

He criticized a D paper as follows:

> D. All generalities and no examples. Fills up space without saying anything. Isn't do anything right. Some generalities weren't that bad, but you can get that in class.

In response to our more general questions, Matthew had said he wanted his students to respond to the works they read, to have an idea of what the text evokes, and to support their ideas with reference to the text. He also values this in his student papers.

In contrast, Jackson, a college biology teacher, said the following by way of explaining the worth of a student's A paper:

> The student paid attention to instructions. She eased her problems by following instructions, by following the format (lab write-up). She was able to go back and forth to her notes and pull out the information and put it in a certain category.

He explained a D paper in the following way:

> Didn't follow instructions, bunch of rewritten notes, haphazard information, no conclusions. Result of not putting time into it -- not well developed, nor polished.

In response to our more general interview questions, Jackson

had said he wants his students to think critically, to make connections, and to reason logically. Instead, his comments in response to his students' papers indicate that he is looking for replication in these students' writing.

This pattern was evident across the teachers comments about student work. The history and the English teachers used some of the criteria that they had earlier said was important when asked to comment on specific student work. The biology teachers, however, referred to aspects of "scientific reasoning" when they answered our more general questions, but focused on facts in showing us what they considered noteworthy in their students' papers. In the particular assignments the teachers selected to share with us, the history papers were valued for the ability to compare and synthesize the content; the English teachers valued interpretation and defense; and the biology teachers valued replication of facts.

In addition, the language the teachers had available to talk about the thinking reflected in student writing also differed. The biology teachers seemed to have more codified and generally recognizable language to talk about "scientific reasoning," and they particularly called upon this vocabulary in response to our questions about their general conceptions of effective learning. In contrast, the history teachers and the English teachers relied on a more generalized vocabulary, and their comments to the first set of interview questions reflected less awareness of discipline-specific approaches. However, teachers had consistent approaches to the kinds of thinking that they valued, and although they did not have as regularized a vocabulary to identify these concerns, they conveyed them nonetheless. Thus, in some sense, the history and English teachers had language to describe student thinking that they used across situations. And they used their language to bring together aspects of content and structure in ways that their fields talk about -- in ways that the biology teachers were unable to do. The biology teachers said they valued student reasoning in biology, but they did not implement it in their responses to student work, at either the high school or college level. In contrast, the history and English teachers had less of a discipline-specific vocabulary to call upon in talking about student reasoning, but gave more consistent attention to the structure of the argument in their students' papers.

Relationships Among Responses

To investigate further the relationships among teachers' responses in the various contexts included in this study, key variables representing teachers' overall emphases in the various sets of questions were selected for the analysis. A principal components analysis was carried out on these variables, with a Varimax rotation of vectors representing at least 10% of the total variance. A three-factor solution accounted for 47 percent

of the original variance; the final factor loadings from this analysis are presented in Table 6.16.

The variables that load most highly on the first factor are related primarily to teachers' emphasis on the particular content appropriate to their subject area. In contrast, the second factor is defined primarily by variables reflecting the degree of emphasis and articulation of the ways of thinking and reasoning appropriate to a particular discipline. The third factor reflects less a concern with the subject matter of a discipline than an orientation toward students; variables that load highly on it reflect a concern with engaging students in the subject matter, rather than with the nature of the subject matter itself.

This factor structure is particularly interesting in the context of the initial argument guiding the study: we hypothesized that subject matter in each discipline would consist both of specific content and of ways of thinking about that content. The results from the factor analysis suggest that these two aspects of each subject do not exist in opposition to one another in teachers' attention to them, but in fact are somewhat independent: it is possible to give attention to either, to neither, or to both.

Relationships between Subject Emphases and Other Variables

Do these emphases in the teachers' discussions vary in systematic ways with other variables? To explore this, factor scores were calculated from the original variables for each of the three rotated factors. These derived scores were scaled to have a mean of 0 and standard deviation of 1. Relationships between the factor scores, subject area, and level are summarized in Table 6.17.

The results in Table 17 parallel results already presented for the individual variables from which the factors were derived. Specific content was discussed most be the biology teachers, and least by teachers of high school English. (In fact the score for high school English suggests quite an extreme rejection of content by these teachers, in comparison with the concerns of their colleagues.) Ways of thinking show less differentiation among subject areas, though again the biology teachers with their concern for the scientific method were more likely than their peers to emphasize this aspect of their subject. The emphasis on engaging students directly in the material under study emerges as primarily a high school versus college differentiation, though teachers of biology (with their concern for hands-on laboratory experiences) again give slightly more emphasis to this aspect of their teaching.

Table 6.16

Factor Analysis of Emphases in Interview and Questionnaire Responses

	Rotated Factor Loadings		
	Articulation of Specific Content	Articulation of Ways of Thinking	Emphasis on Engaging Students
Background and Training			
Specific Content	.33	-.05	.74
Major Ideas	-.06	.08	-.77
Ways of Thinking	-.21	.23	-.05
Engaging Students	-.09	-.06	.20
The Discipline in General			
Ways of Thinking	-.30	.11	-.06
Specific Content	.17	-.09	.01
Engaging Students	-.45	-.12	.35
Values and Orientation	.12	-.44	.09
Articulation of Rules of Evidence and Procedures in Discipline			
Overall Rating	.21	.52	.37
Specific Reasoning Operations	.08	.71	.30
Content of Specific Unit			
Major Concepts	-.50	-.10	-.24
Specific Content	.74	-.28	-.04
Ways of Thinking	-.19	.70	-.07
Engaging Students	-.25	.29	.73
Approach to Unit			
Interpretation	-.66	.38	.40
Transmission	.72	-.15	-.24
Overall Emphasis in Units			
Ways of Thinking	-.31	.67	-.28
Specific Content	.87	-.07	-.08
Engaging Students	-.30	.19	.69
Degree of Articulation of			
Content	.71	.09	-.25
Ways of Thinking	-.06	.79	.17

Table 6.17

Factor Scores By Subject and Level

Factor Score	Biology (n=13)	History (n=15)	Literature (n=14)
Articulation of Specific Content			
High School	.79 (.7)	.38 (.7)	-1.56 (1.1)
College	.56 (.9)	.14 (.5)	.22 (.3)
Articulation of Ways of Thinking			
High School	.15 (.9)	-.45 (1.2)	.14 (1.4)
College	.33 (1.3)	.06 (.7)	-.06 (.7)
Emphasis on Student Engagement			
High School	.79 (.5)	.73 (.5)	.41 (.6)
College	.29 (.6)	-1.13 (.4)	-1.02 (.8)

ANOVAS

Effect	df	F - Statistics		
		Content	Thinking	Enjoyment
Subject	1;36	15.99***	0.63	5.86**
Level	2;36	0.74	0.27	47.78***
Interaction	2;36	6.96**	0.43	4.39*

* p< .05
** p< .01
*** p< .001

Of the three dimensions of emphasis, those related to content and ways of thinking are most important to the present study. Taken together, they define groups of teachers with quite different orientations toward their subjects and their teaching. To explore the relationships between these orientations and other variables, participants in the study were divided according to their scores on these variables into those who were "high" (scoring above the mean) and those that were "low" (scoring at or below the mean) relative to their colleagues. This defined four groups of teachers: those who (relative to their peers) rated highly for attention to both content and ways of thinking; those who rated highly for emphasis on content only; those who rated highly for emphasis on ways of thinking only; and those who did not articulate a clear concern with either. The distribution of these four groups across subjects and levels is summarized in Table 6.18.

The biology teachers, as a group, were most likely to emphasize content, but a sizeable proportion of them also emphasized ways of thinking. The history teachers were more likely to emphasize specific content, though at the college level a sizeable number emphasized instead ways of thinking. The literature teachers as a group were most likely to emphasize ways of thinking, though a number were not able to articulate either their content or ways of thinking about that content.

To what extent do these classifications, based on teachers' general comments in a variety of contexts, relate to their specific attempts to articulate what counts as important? To explore this, these classificaitons were related to two additional sets of measures that were not included in the factor analyses: the number and kinds of arguments and evidence that the teachers pointed out as appropriate to their subject area (interview 1), and the number and kinds of comments that they made in discussing good and poor student papers (interview 2).

Table 6.19 summarizes results for the kinds of arguments and evidence that each group of teachers was able to muster. The teachers who placed a greater emphasis on teaching students to think in disipline-specific ways mentioned more subject-specific reasoning operations, cited more kinds of evidence that were appropriate to their subject area, and had a higher total of different kinds of arguments and evidence than did those teachers who gave less attention to ways of thinking as part of their discussions of their subject and their teaching. Interestingly, the teachers who emphasized both content and ways of thinking in their comments were also most able to discuss specific types of arguments and evidence appropriate to their disciplines. As we saw in examining subject-area and level differences earlier, however, all groups of teachers made similar use of a generic language for discussing ways of thinking.

Table 6.18

Percent of Teachers Emphasizing Specific Content, Ways of Thinking and Engagement of Students in the Learning Process

	Percent of Teachers					
	Biology		History		Literature	
Emphasis	High School (n=8)	College (n=5)	High School (n=8)	College (n=7)	High School (n=6)	College (n=8)
Content and Thinking	37.5	40.0	12.5	14.3	0.0	12.5
Content Only	50.0	40.0	75.0	42.9	16.7	12.5
Thinking Only	12.5	20.0	0.0	42.9	50.0	37.5
Neither	0.0	0.0	12.5	0.0	33.3	37.5
Engaging Students	87.5	80.0	87.5	0.0	83.3	12.5

Table 6.19

Types of Arguments and Evidence by Teachers' Emphasis

	MEANS (SD)			
	Both (n=7)	Content Only (n=17)	Thinking Only (n=11)	Neither (n=6)
Types of Thinking Strategies				
Subject-Specific	2.43 (2.1)	.47 (.7)	1.09 (1.3)	1.00 (1.1)
Generic: Generalized	1.71 (1.0)	1.53 (1.1)	1.82 (1.4)	1.00 (1.3)
Generic: Particular	.57 (1.1)	.41 (.7)	.45 (.5)	.67 (1.2)
Types of Evidence	3.57 (1.7)	2.82 (1.0)	3.09 (1.1)	1.83 (.8)
Total Arguments and Evidence	8.29 (3.3)	5.24 (1.4)	6.45 (2.8)	4.50 (2.3)

ANOVAS

Effect	df	F - Statistics				
		Subject Specific	Generic General	Generic Particular	Evidence	Total
Content	1;37	0.82	0.30	0.08	3.68	3.03
Thinking	1;37	7.20**	1.37	0.00	6.44*	12.50***
Interaction	1;37	4.77*	0.63	0.51	0.44	0.56

* $p < .05$
** $p < .01$
*** $p < .001$

Table 6.20 presents a similar summary of the types of comments these teachers offered in response to student papers. Here there are no differences in the total number of different features the teachers commented on, but there are differences in the number of comments reflecting content and thinking. In particular, the group of teachers who emphasized content in their general comments were also more likely to comment on content in student papers, while those who focused on student thinking were more likely to continue to do so in reacting to student papers.

Discussion

It is important to not lose sight of the first finding presented in this chapter, which points out that while teachers at all levels emphasized the importance of ways of thinking at an abstract level, when called upon to put these goals into practice their emphasis across all the discussions was more heavily on content than on the ways the students could reason about the content. But clearly, the English and History teachers, at least those we studied, are struggling to construct a classroom context where ways of thinking can have room to be taught. Similarly, the biology teachers for whom the "scientific method" and its associated vocabulary provides a more widely available codification of ways of thinking said they wanted to apply it in their coursework, although there was little evidence of this in their discussions of how they structured their teaching.

Table 6.20

Number and Type of Comments on Student Papers by Teachers' Emphasis

	MEANS (SD)			
Types of Comments	Both (n=8)	Content Only (n=17)	Thinking Only (n-11)	Neither (n=6)
Student-Oriented	.25 (.5)	.53 (.8)	.64 (.7)	2.00 (1.4)
Content-Oriented	1.25 (1.0)	1.41 (.9)	.82 (1.0)	.17 (.4)
Thinking-Oriented	3.00 (1.9)	2.88 (1.3)	3.45 (1.4)	2.50 (1.0)
Total Comments	4.63 (1.1)	4.88 (1.6)	4.91 (1.4)	5.00 (2.1)

ANOVAS

Effect	df	F-Statistics			
		Student	Content	Thinking	Total
Content	1;38	11.02**	7.39**	0.01	0.16
Thinking	1;38	7.20**	0.35	1.01	0.14
Interaction	1;38	3.85	1.78	0.79	0.03

* p < .05
** p < .01
*** p < .001

Chapter 7

Conclusion

In this study we have examined two quite different sets of information about conceptions of "knowing" in biology, American history, and American literature. One set of information consisted of the scholarly and professional literatures in each of the three subjects; the other consisted of high school and college teachers' comments about the subjects they teach.

In this chapter we will review the results from both of these strands of work. We will first review what, in the abstract, scholars and teachers consider to be important in the three subject ares. We will then discuss the extent to which these abstract values seem to be translated into educational practice. Finally, we will consider the factors that shape the patterns that we have found, and their implications for our more specific concerns with writing instruction and learning to write.

What Constitutes "Knowing"

This issue was examined in each of the sets of data that we collected. In the literature reviews, we found that discussions in all three subject areas have, to varying degrees, emphasized both specific content and ways of thinking as central to becoming expert within the discipline. The role of these two aspects of knowing has perhaps been most sharply debated in the field of biology (or more generally, in the various physical and biological sciences), where there is a long history of searching for "objective" knowledge, and a concomitant concern with codifying the "scientific method" that guides and enables that search. More recently, the validity of both of these concepts has been called into question, as scholars have challenged the independence of method and observation, arguing instead that the "facts" we discover are shaped and conditioned by our general theoretical and methodological presuppositions. Either formulation, however, would lead to a program of science education in which learning to "think like a scientist" would play an important role.

Discussions of history have similarly placed a continuing emphasis on the twin issues of method and content. The word "history" itself derives from a Greek root meaning "to inquire," and much of the debate in the field has concerned the most appropriate methods of inquiry. Past decades have seen shifts from history as (perhaps idiosyncratic) narrative to history as objective scientific inquiry to history as interpretation. This latter shift, like that in science, has been driven by critiques of claims that "objective" or theory-neutral observations can ever exist, and by the emergence of "subjective" influences as a

legitimate, even central, part of the historical enterprise. These debates about historical method have been paralleled by debates about the appropriate content of history. If history had developed a kind of canon of historical topics which focused on wars and kings and major events, it has expanded during recent decades to include the "antiheroes" of the past: "blacks, Indians, Orientals, women, immigrants, city residents, slum dewellers, sweatshop workers, labor organizers, and political radicals" (Hamerow (1987).

Discussions of literature also display a history of debate about proper approaches to literary texts. These "schools" of criticism or of literary theory represent alternative formulations of what literature is about, and of what should count as evidence in the defense of competing interpretations. The past 100 years have seen a variety of approaches--moral, philological, historical, sociological, New Critical-- emerge in turn as dominant in literary studies, but the present decade is marked more by diversity than by consensus. Approaches variously labelled as constructionist, reader response, Marxist, feminist, structuralist, deconstructionist, post-deconstructionist, and psychoanalytic vie among themselves (and with other theories) for preeminence. Though many of the arguments parallel the more general debate about objectivity and subjectivity that has also influenced conceptions of science and of history, no one approach to critical theory in literature has emerged to clearly dominate contemporary scholarship.

Discussions of specific content in literature have usually focused on the nature of the canon: what literary works should one have read. This approach has a long history, and continues to play a major role in contemporary debates where, as in history, many have sought a deliberate broadening of the canon to include works representing a wider variety of authors, cultures, and points of view. An alternative approach to content in literature has focused on developing students' "appreciation," a "habit of life-long reading," or "critical reading skills"-- at which point the specific content of literature begins to merge with the "ways of knowing" represented by the favored school of critical theory.

Emphases in the literature reviews for the three subject-areas thus all reflect twin concerns with specific content and with accepted procedures for dealing with that content--with ways of knowing. Debates occur about both what specific content should be included, and what approaches or methods of study are most appropriate. But there is little debate that both content and approach define what is unique and important about each discipline.

When we turn to the interview study examining high school and college teachers' perceptions of their subject areas, similar concerns with both specific content and ways of knowing are readily apparent. Overall, the majority of teachers saw the primary value of their subject area in its ability to help

students better understand their own lives or the society in which they live. For most, this meant less a knowledge of particular content than an awareness of broad issues and themes, and the development of particular ways of analyzing evidence, making interpretations, and and defending their own point of view.

At an abstract level, then, there seems to be almost complete consensus that "knowing" in these three disciplines involves both content and ways of thinking-- and that if either should play a secondary role, it is the content rather than the approach.

Emphases in Educational Practice

If there is consensus in the abstract about the importance of both specific content and ways of thinking, in practice all three subject areas seem to have devoted most of their attention to specific content. This is perhaps most evident in biology, where the long tradition of concern with scientific method has manifested itself both in philosophical analyses of what constitutes "scientific method" and in pedagogical proposals for "inquiry-based instruction." Such a tradition would seem to insure classroom emphasis on the rules of evidence and procedure that guide the work of the practicing scientist, but our review of the related literature on biology instruction suggests otherwise. That literature suggests instead that leaders in science teaching have been calling at least since the turn of the century for an emphasis on "reasoning out" rather than memorization (Hurd, 1961), but that memorization of specific content continues to dominate. Textbooks, which are used by 90 percent of high school science teachers 90-95 percent of the time, shape the curriculum, and the textbooks themselves have become almost overwhelming in the amount of specific content they seek to convey. In fact the typical biology course requires students to master several times as many new words as they would learn if they were studying a totally new language (Yager, 1983). Recent reforms in biology instruction have altered (or sometimes simply augmented) the particular content to be included, insuring it reflects the most recent findings as well as new emphases, such as ecology.

As the specific content has proliferated in biology courses, attention to the scientific method has failed to provide a countervaling emphasis on the nature of scientific thinking. The most promising attempts to focus on such thinking have stressed "inquiry" approaches, where students would learn the process of science through their own investigations. Such approaches, though enthusiastically endorsed by each wave of educational reform, have never been widely adopted. In the end, most courses seem to stress the value of a "scientific method" without providing students with the procedural knowledge and experience to apply such approaches successfully themselves.

Our review of the related literature on the teaching of history and of literature suggests a similar pattern of particular content that has been altered and augmented in the course of curriculum reform. Recent reforms have changed the "faces" in the textbooks, and broadened the curriculum to represent more diverse groups and cultures. In history as in biology, there has been a parallel emphasis on "inquiry" approaches designed to introduce students to the methods and procedures of the historian, but again though often-advocated such methods seem to have made few inroads in practice. In literature, reader-response based methods, which place the responses of the reader rather than the specific content of the text in a central role, have been receiving increasing emphasis in discussions of pedagogy, but again it is unclear the extent to which such approaches have affected classroom instruction.

When we turned from literature reviews to discussions with high school and college teachers, these trends continued. The overall picture that emerged in all three subjects was one of a relatively traditional approach to instruction, with lectures and teacher-led discussion playing the dominant role, and with student centered activities appearing less frequently. In this, the results from our samples of teachers parallel those from recent national surveys (e.g., Applebee, Langer, and Mullis, 1987). Such a pattern of instruction may be particularly appropriate for an emphasis on the transmittal of specific content, and it is perhaps not surprising that such an emphasis emerged more strongly as teachers moved from discussions of general philosophy to the details of particular classrooms. The one exception to this may be the teachers of literature, who more than the others avoided emphasizing particular content and paid more attention to the arguments their students were building. Even for them, however, the general picture was one of commitment in the abstract to teaching ways of thinking, and a failure in practice to find comfortable ways to emphasize these goals.

A Failure of Articulation

The results of our study parallel other research that suggests that the closer we get to the classroom, the greater the emphasis on specific content at the expense of the rules of argument and evidence that represent the ways of thinking unique to each discipline. Our findings go further, however, to suggest that one of the causes of this problem may lie in a general failure to clarify and articulate those rules of argument and evidence in ways that teachers can use to think about what they are teaching and to guide their evaluation of student work. (A separate question, not addressed in this study, concerns whether specifying such rules of evidence for students would also help them learn to use them, or would like the rules of grammar simply add another layer of specific content to be mastered.)

Our general failure to articulate the ways of thinking, or the rules of argument and evidence, specific to each discipline

began to be apparent in the reviews of each of the related literatures. At first glance, the field of biology, with its concern for the nature of the scientific method, would seem to illustrate the opposite situation: a field with a long tradition of scholarly explication of appropriate methodologies. Yet on closer examination, explications of the scientific method suffered from two problems that have been pointed out by scholars in the field: 1) the methods codified do not reflect the processes of problem definition and problem resolution characteristic of skilled scientists, but instead present an idealized representation of the results of scientific inquiry; and 2) the attention to scientific method has included little concern for practical heuristics, to ways of solving the problems that scientists confront. A third problem emerged from examining the literature on biology instruction, where we found that even when there was an emphasis on inquiry-based or related methods, there was little or no attention to expressing the results of such inquirys in "scientific prose"--little attention, that is, to teaching students how to muster arguments and evidence in a way appropriate to their discipline.

When we turned from the literature reviews to our interviews with high school and college teachers, their responses reflected the emphases within the discipline as a whole. Biology teachers had a larger vocabulary to talk about discipline-specific forms of argument and evidence than did their colleagues who were teaching American history or American literature. In the latter disciplines, teachers relied upon a discipline-specific pattern of usage of a more generic vocabulary (structuring their discussions around such terms as "interpretation," "causality," or "analysis"). In all three disciplines, however, the overwhelming characteristic of teachers' discussions of such issues was their inexplicitness.

In fact, for all the teacher we studied, notions of discipline-specific ways of thinking were mostly implicit. They had a more or less well established vocabulary, but not a systematic or well-operationalized way to think about it, and so their talk about ways of thinking came and went -- unnoticed and unmarked. Perhaps because of this, biology teachers, for example, felt no contradiction in relying heavily on objective tests to measure student achievement, though at a more idealized level they stressed "scientific methods" and "ways of thinking" as goals for their courses. Conversely, when they were confronted with student writing to evaluate, they gravitated most comfortably to issues of content and scope of knowledge, rather than to how evidence was evaluated and displayed as part of scientific discourse.

In light of such results, previous findings about students' inability to engage in critical thinking in the context of a variety of academic subjects come as no surprise. Students are unlikely to be learning how to muster evidence and develop effective arguments when their teachers (and the field in general) have not articulated such concerns clearly to

themselves. Scholarly emphases on the tentativeness of knowledge and the need for inquiry have not generally become part of the teachers' consciousness -- or are either so vague or so tacit that teachers cannot talk comfortably about them. And so, for students, instructional experiences on ways to think about what they are learning are likely to be either unfocused or sporadic, with critical approaches inconsistently flagged and codified.

Next Steps

This study raises more questions than it answers. If there is a general consensus across the three disciplines that students should be learning both specific content and ways of thinking, there has been an equally clear failure in all three disciplines to put such goals into widespread practice. Certain issues emerge across our literature reviews and interviews, however, that suggest problems that need addressing.

Articulating Discipline-Specific Patterns of Discourse

Neither the teachers in our sample nor the scholarly and professional literatures in the three subjects we studied could provide a clear articulation of the discipline-specific ways of thinking, the patterns of argument and evidence, that they claimed to value. And because they could not articulate these patterns clearly, they failed to give them the emphasis in practice that they gave them in theory. At the level of specific curriculum, in the tests they constructed, and in their reactions to student writing, teachers focused on what they could best articulate-- and most often that consisted of one or another aspect of the specific content of their discipline. Any real change in classroom emphases may be dependent upon providing a clearer and better articulated set of concepts that teachers can use as they plan, carry out, and evaluate instruction that places as much emphasis on discipline-specific patterns of discourse, and the ways of thinking such discourse represents, as it does on specific content.

Tests

Clearly, tests and their accompanying grades remain one of the most powerful ways in which we teach students what is important in the subjects they are studying. Equally clearly, objective tests are most easily graded, but they also place a perhaps inadvertant emphasis on specific content at the expense of ways of thinking. If discipline-specific modes of argument and evidence are to receive more balanced attention, we must find ways to reintroduce them into the tests that are used-- at the classroom as well as the school or district level. The traditional essay examination, no longer widespread except in the humanities, may be one of the simplest ways to achieve this.

Curriculum Coverage

One of the complaints that emerged most frequently in both the literature reviews and the interviews was that "inquiry-based" or other approaches that emphasize student thinking take up too much time in an already full curriculum. Such issues are real, but the argument is persuasive only to the extent that the teaching of ways of thinking reflects a minor goal rather than a major emphasis of successful academic learning. To the extent that "knowing" requires mastery of both content and ways of thinking, then we cannot solve the problem of time by eliminating an emphasis on thinking from the curriculum. To place this in perspective, we need a reassessment of what is essential in each subject area, and how it can best be introduced in a manageable curriculum across the school years.

The Role of Writing

Student writing can provide an excellent context for the development of discipline-specific skills in the development of argument and evidence. In writing at length about a topic (whether presenting an experiment, analyzing an historical episode, or interpreting a work of literature), a student must develop appropriate evidence and organize and present it in an effective manner. For writing to function in this way, however, the teachers who read and evaluate that writing must be able to articulate what they are looking for in the writing. Otherwise the writing that results will be evaluated for what is most obvious and apparent--usually errors in specific content, or infelicities in grammar and usage.

Such uses of writing should contribute to the development of students' writing abilities, but more importantly they will contribute to their knowledge of their subject. They will learn the rules of argument and evidence that all agree are an important part of subject area knowledge, but that receive consistent attention in far too few classrooms.

Honing the Language of Instruction

In all of the interviews we conducted, teachers of each subject voiced implicit, but shared, concerns about students' learning to think in new ways about the particular coursework they are studying. And this, at least, is a place for instructional research to start. To move pedagogy from vague comments to focused action, we will need studies that help codify what teachers in each field say they care about. Their own language can then be given back to them to reflect upon, and discuss, and consider -- in a manner that encourages clarification of goals and movement toward a more common language of instruction. Such a forum can become a communicative arena in which a community of researchers, teachers, and scholars reflect on both language and ideas within an academic field -- as they consider their pedagogical values and goals and how to achieve them.

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Appendix

Interview Schedules and Questionnaire

Academic Learning Project
Principal Investigators:
Judith A. Langer
Arthur N. Applebee

Teacher Interview #1

Teacher's Name_____

REMINDER TO TEACHER: All responses and materials will be used anonymously.

A BIT OF BACKGROUND

1. What is/are the exact name(s) of the American Literature course(s) you teach?

2. What grade level(s) are the students in the course?

3. How many sections of the course do you teach?

4. Approximately how many students are enrolled in each section of this course with you.

5. (For college or private school teachers only) How often do the students meet for class with you, and in what size groups? (i.e. are there separate lecture, discussion, and lab meetings?)

THE DISCIPLINE

6. Why is it Important for students to study American Literature? Why American Literature instead of the many other things they could be studying?

7. Are there some things about American Literature you think all students should know?

8. At the level at which you teach literature, what kinds of reasoning or interpreting do you expect from you students?

9. What kinds of evidence or justification should students use for their reasoning or interpreting?

10. How do you handle a situation where a student comes up with an interpretation or conclusion that is controversial or that you find unacceptable?

11. Do you find that there are competing approaches advocated in the discipline of literature? If so, do you find any of these particularly attractive or problematic? Please explain.

12. Do these competing approaches play themselves out in your classroom? If so, how?

COURSE EXPECTATIONS

13. What do you assume students know when they begin your American Literature course?

14. What would you _like_ your students to know when they _begin_ your American Literature course?

15. What would you _like_ students to take with them when they _complete_ this course?

A FINAL QUESTION

16. What does it mean to know literature?

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Teacher Interview #2

Teacher's Name_____

Prompt: Using the materials you have brought with you, please talk about the various dimensions of the American Literature unit you have selected for discussion here. After you have provided an overview of the unit, please discuss in detail a 1-3 day lesson from the unit.

Prompts for during and after the unit and lesson discussion:

(1) What would you like students to take with them from this unit or lesson?

(2) How would you know students have learned what you want them to learn from this unit?

(If student papers are provided.....)
(3) Take one of the stronger papers and talk through what the student is doing. What are the greatest strengths of the paper? Its problems? What continuing growth would you expect to see as this student continues to study literature.

(4) Now take one of the weaker papers and talk through what the student is doing. What are the greatest strengths of his paper? What are the problems? What continuing growth would you expect to see as this student continues to study literature?

(5) Now consider the weak and strong paper together. In what ways are they similar? How do they differ from the remaining papers?

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Teacher Questionnaire

Name_____

NOTE: All responses and materials will be used anonymously. If you need more space, please use back side.

1. When did you receive your degree(s)?

2. What was/were your major(s)?

3. What sorts of coursework did you take in history? In what ways has this coursework been helpful in your teaching? In what ways not helpful?

4. What teacher training courses did you take specifically related to the teaching of history or social science? In what ways was this coursework helpful? In what ways not helpful?

5. Is there anything else that has significantly influenced what or how you teach today? (Experiences, people, ideas, etc.) If so, please explain.

6. Do you belong to any professional organizations? If so, which ones.

7. What kinds of reading do you do related to your work and your profession? Please specify.

8. How do you organize the topic in your classes in American History? (If possible, please attach a brief outline or a copy of the syllabus if you use one.)

9. What textbooks or books do you use for teaching American History? How were they chosen? Please comment briefly on the strength and weaknesses of these books.

10. Do you supplement the books with additional material? If so, with what?